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VOL. 3, NO. 4, WINTER 2008 (OCTOBER-DECEMBER)

EDITOR'S NOTE

THE WAR AGAINST INDIA

As we were going to the press, the horrendous terrorist act on November 26, which should be properly called a meticulously planned covert war on Mumbai executed ruthlessly with military precision, took nearly 200 lives and injured close to 450 persons. All this unbelievably carried out by just ten *jehadis*. One of them was captured alive and gave crucial information supplementing the intelligence reports of the fuse wire leading back to Pakistan. The electronic media covered the tragedy from outside for 60 hours and played snippets from it later, including the live footage of two terrorists moving around the Victoria Terminus. The nation nearly exploded in anger.

Taken with the use of terror as an instrument of policy for more than two decades, this is one battle in the long war against India. And this has been the first war through terror played out in front of TV cameras. But the sheer timing and nature of the attack ensured that the policy options available to India would be constrained, the leeway available to the elected government in Islamabad, with the Pakistan Army constantly looking over its shoulder while exercising real power, would be limited, and the diplomatic manoeuvrability available to the international community, especially the United States bogged down on Pakistan's western border, would be very low. Yet Pakistan has to deliver results and no amount of India bashing would substitute for action. Its civil-military government which claims, and is answerable for, sovereignty may be afraid of the hydra-headed monster it has created (it was Benazir's government that created the Taliban and the army-Inter-Services Intelligence (ISI) combine took it further); but this

sovereignty is valid only if it is exercised in the domestic domain to end the terrorism that today also afflicts Pakistani society.

The big question is: what happens if Pakistan keeps trying to wriggle out of promises that it would be unwilling or unable to keep? At some stage, a military option would become necessary, even if for what the Chinese have always stated: "teaching lessons." Never before has India had a greater legitimacy or international acceptance for the use of force for punitive response if Pakistan does not act in finding acceptable solutions. The question that needs answers is: how should that military option be exercised to produce maximum results with minimum costs? Direct ground force strategy would lead to escalation and increase international concerns about a nuclear exchange. Mobilisation of forces *a la* Parakaram, therefore, could be counter-productive. Hence, the basic instruments of choice now are the air force, the navy and/or special forces. Here, unlike the Parakaram crisis, we need to ensure we have clear, legitimate and achievable aims. In this context, terrorist training camps, though legitimate, are hardly the targets for punitive action.

On the other hand, "terrorist infrastructure" would cover a large number of legitimate targets, especially in Pakistan Occupied Kashmir (POK) from which (and for which) most of the quarter century's terrorist war has been prosecuted. Military force application now seeks effect-based operations mostly conceived in terms of military effects. But in the current scenario, we need effect-based operations for *political-economic effects*. Hence, air strikes in POK road bridges, power stations, etc. The onus of escalation would be on Pakistan, and it may well launch its air force in return. However, the Indian Air Force (IAF) can more than hold its own against the Pakistan Air Force (PAF) which would have to contend with the high risk of major losses of aircraft and infrastructure which would set its rapid air force modernisation back by a decade or two. The key lies in mobilising ground forces to the very minimum to defend against the Pakistan Army.

Meanwhile, the United States must understand that Pakistan's "cooperation" in its war against terrorism in the past seven years has been cosmetic at best. The Mumbai attack, no doubt for multiple objectives, also

seeks to try and undermine the US surge in strikes across the borders of the Northwest Frontier Province (NWFP) by the threat of pulling out forces to defend against India. These strikes, however, could continue even if Islamabad pulls out its army (which has had a pathetic record of counter-terrorism) from that region. The basic lesson for the Western capitals and New Delhi is that the world has tackled terrorism through a defensive war primarily focussed on eliminating terrorists and their leadership. Unless there is a change in the policies followed by those who promote and facilitate religious terrorism, the use of terror as an instrument of policy is unlikely to be reversed. And that should be the aim of counter-terrorism today.

THE ROCKY ROAD TO FULL JOINTNESS

PROGRESS AND SETBACKS IN RECENT AMERICAN AIR WARFARE EXPERIENCE[1]

BENJAMIN S. LAMBETH

The American experience at 21st century warfare to date has offered repeated opportunities for students of national security affairs to observe joint-force operations in action and to draw due conclusions regarding the progress that American joint combat has made, both for better and for worse, since its initial baptism by fire during Operation Desert Storm in 1991. That experience has been dominated by a remarkable transformation in the combat repertoires of the US Air Force and Navy in the realm of integrated aerial strike operations, as was resoundingly attested by the near-seamless joint conduct of both kinetic attacks and supporting activities by the two Services in Operations Enduring Freedom and Iraqi Freedom. It also has featured notable, if more uneven, progress in the conduct of integrated air-land operations in those two major wars and in the subsequent counter-insurgency (COIN) campaigns that have continued to this day in Iraq and Afghanistan.

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1. **Benjamin S. Lambeth,** RAND Corporation, presented this paper at the 14th International Air Strategy Symposium on the subject of "Jointness: A War Experience" held at Korea Air University, Daejeon, South Korea, on September 25, 2008. We are grateful to the president, Korea Air University and the author for permission to publish this paper. Any views expressed in it are solely those of the author and should not be interpreted as reflecting the official views of the RAND Corporation or of any of its governmental or private research sponsors.

One of the most remarkable and praiseworthy aspects of American combat capability today is the close harmony that has evolved since the 1991 Persian Gulf War in the integrated conduct of aerial strike operations by the US.

This paper, tasked with offering a capstone perspective on recent trends in joint warfare, will review those examples of exemplary success, more fitful progress, and continued atavistic practices in the American effort to forge a true cross-Service integration of capabilities and functions in the interest of joint force commanders in all mission areas. The paper will begin by describing briefly how the air force and navy since Desert Storm have, through the collective effort of like-minded operators in both Services far removed from the roles-and-missions squabbles and budget battles inside the Washington Beltway, progressively evolved a unified approach to aerial strike operations that can be held up as a role model for the sorts of improvements that the army and marine corps could, in principle and with the right incentives and determination, also effect in the joint arena. It will then consider some representative aspects of air-land warfare in the three-week major combat phase of Operation Iraqi Freedom and in the ensuing COIN wars in Iraq and Afghanistan that bear witness both to laudable progress and to continued problems along the road to a fully mature American joint warfare repertoire. Finally, the paper will offer some brief concluding reflections on the timeless constants that will largely determine the extent to which such progress can be expected to continue.

EXEMPLARY AIR FORCE-NAVY INTEGRATION IN STRIKE WARFARE

One of the most remarkable and praiseworthy aspects of American combat capability today is the close harmony that has evolved since the 1991 Persian Gulf War in the integrated conduct of aerial strike operations by the US Air Force and US Navy.[2] For years, the navy was accustomed to operating independently

2. For a full account of this experience, see Benjamin S. Lambeth, *Combat Pair: The Evolution of Air Force-Navy Integration in Strike Warfare* (Santa Monica, Calif: RAND Corporation, MG-655-AF, 2007). A more condensed version may be found in Benjamin S. Lambeth, "Air Force-Navy Integration in Strike Warfare: A Role Model for Seamless Joint-Service Operations," *Naval War College Review*, Winter 2008, pp. 27-49.

on the high seas, with a consequent need to be completely self-reliant and adaptable to rapidly-changing circumstances far from the nation's shores and with the fewest possible constraints on its freedom of action. Largely for that reason, operations integration with the air force was not even a remote consideration. On the contrary, the main focus was rather on force *deconfliction* between the two Services. Not only figuratively but also literally, the navy and air force conducted their routines in separate and distinct operating environments, and no synergies between the two Services were produced—or even sought.

These divergent Service approaches to air operations persisted throughout the 1970s and early 1980s, with the final years of the Cold War seeing little significant change from the previous pattern of segregated operations that were the norm.

These divergent Service approaches to air operations persisted throughout the 1970s and early 1980s, with the final years of the Cold War after the nation's combat involvement in Vietnam ended in 1973 seeing little significant change from the previous pattern of segregated operations that were the norm throughout the eight-year air war in Southeast Asia. Given their stark dissimilarity in outlook and mission orientation, the navy and air force, in a fair characterisation, "simply thought about and operated within two separate conceptual worlds."[3] Operation Desert Storm, however, made for a major turning point in this respect. Iraq's sudden and unexpected invasion of Kuwait in August 1990 presented naval aviation with new and unfamiliar challenges. Simply put, the 1991 Gulf War in no way resembled the open-ocean battles that the navy had planned and prepared for throughout the preceding two decades.

With respect to equipment, the naval air capabilities that had been fielded and fine-tuned for open-ocean engagements, such as the long-range AIM-54 Phoenix air-to-air missile carried by the F-14, were of little relevance to the coalition's predominantly overland air combat needs. Navy F-14s were not assigned to the

3. Major General John L. Barry, USAF, and James Blaker, "After the Storm: The Growing Convergence of the Air Force and Navy," *Naval War College Review*, Autumn 2001, p. 122.

choicest combat air patrol (CAP) stations in Desert Storm because, having been equipped for the less crowded outer air battle in defence of the carrier battle group, they lacked the redundant onboard target recognition systems that the rules of engagement promulgated by US Central Command (CENTCOM) required for the more conflicted air environment over Iraq. Similarly, in the land-attack arena, because of the navy's lack of a significant precision-strike capability, its six carrier air wings that participated in Desert Storm were denied certain targets that were assigned to the air force instead by default.

Fortunately, although naval aviation entered the post-Cold War era ill-equipped for the latter's new demands, the navy quickly made the necessary adjustments in the early aftermath of Desert Storm. In the realm of equipment, it stepped out smartly to upgrade its precision strike capability by fielding both new systems and improvements to existing platforms that soon gave it a degree of flexibility that it had lacked throughout the five-week Gulf War. First and foremost, it moved to convert the F-14 from a single-mission air-to-air platform into a true multi-mission aircraft through the incorporation of the air force-developed LANTIRN infrared targeting system that allowed the aircraft to self-designate laser-guided bombs (LGBs) both day and night.[4]

The navy leadership also rectified its shortfall in precision-guided munitions (PGMs) delivery capability by equipping more F/A-18s with the ability to fire the AGM-84E standoff land-attack missile and to self-designate aim points for LGBs. To correct yet another equipment-related deficiency highlighted by the Desert Storm experience, naval aviation also undertook measures to improve its command, control, and communications arrangements so that it could operate more freely with other joint air assets within the framework of an Air Tasking Order (ATO). Those measures most notably included gaining the long-needed ability to receive the daily ATO aboard ship electronically. Finally, in the realm of doctrine, there was an emergent navy acceptance of the value of strategic air campaigns and the idea that naval air forces must become more influential players in them.

4. LANTIRN is an acronym for "low-altitude navigation and targeting infrared for night."

To be sure, despite such trends toward more harmonious cooperation, a number of disconnects between the navy and air force persisted throughout the 1990s. One recurring manifestation of the cultural divide that still separated the two Services came in the form of continued expressions of navy discontentment with the air force-inspired ATO and the way in which, at least in the view of many naval aviators, it sometimes made less than the best use of the nation's increasingly capable carrier-based strike forces. Some of those complaints, however, merely reflected a less than full understanding of the air tasking process and what lay behind it. Most, moreover, would have been voiced under just about any alternative mission management arrangements. Often overlooked was the fact that North Atlantic Treaty Organiston (NATO) operations over the former Yugoslavia throughout the 1990s were highly constrained exercises in which it was not possible for planners in the Combined Air Operations Centre (CAOC) to make optimal use of *any* air assets, navy or any other. In those cases, the ATO often provided a convenient lightning rod for navy complaints that were actually prompted by the severe operating limitations that were imposed by political leaders in the interest of avoiding fratricide, collateral damage, non-combatant civilian casualties, and other violations of standing rules of engagement, with the intent to both reassure reluctant NATO allies and prevent tactical mistakes from producing undesirable strategic consequences.

Despite such trends toward more harmonious cooperation, a number of disconnects between the navy and air force persisted throughout the 1990s.

The most influential factor in bringing the two Services together during the 1990s was the nation's ten-year experience of Operations Northern and Southern Watch, in which both air force land-based fighters and navy carrier-based fighters jointly enforced the UN-imposed no-fly zones over northern and southern Iraq

The most influential factor in bringing the two Services together during the 1990s was the nation's ten-year experience of Operations Northern and Southern Watch.

that were first put into effect shortly after the conclusion of Desert Storm. That prolonged aerial policing function proved to be a real-world operations laboratory for the two Services, and it ended up being the main crucible in which their integration in strike warfare was forged. By conscious choice, both Services sent their best operators to serve temporary-duty assignments in the supporting CAOCs in Turkey and Saudi Arabia to work together in the joint planning and execution of those non-stop air operations over Iraq. Over time, their working relations became more and more seamless. Viewed in hindsight, this convergence was not just a result of the navy's need to acquire the wherewithal for remaining relevant in joint warfare. It was even more a direct outgrowth of conscious leadership determination in *both* Services, based in considerable part on their steadily-evolved mutual trust relations over time, to move toward a more common operating culture when it came to coordinated joint-force execution.

This gradual process of operational integration saw a final convergence over Afghanistan during Operation Enduring Freedom against the Taliban and Al Qaeda. The terrorist attacks carried out against the United States on September 11, 2001, levied upon the nation a demand for a deep-strike capability in the remotest part of Southwest Asia where the United States maintained virtually no access to forward land bases. That unusual demand required the navy's carrier force to provide the bulk of strike-fighter participation in the joint air war over Afghanistan that ensued soon thereafter.[5] To be sure, air force heavy bombers also played a prominent role in that air-centric campaign. Nevertheless, carrier-based aviation operating from the North Arabian Sea substituted almost entirely for what would have been a far larger complement of land-based fighters in other circumstances because of an absence of suitable forward operating locations close enough to the war zone to make the large-scale use of the latter practicable.

5. For a full treatment of that joint air war, see Benjamin S. Lambeth, *Air Power Against Terror: America's Conduct of Operation Enduring Freedom* (Santa Monica, Calif.: RAND Corporation, MG-166-1-CENTAF, 2005). For additional specifics on naval aviation's integrated contributions to it, see also Benjamin S. Lambeth, *American Carrier Air Power at the Dawn of a New Century* (Santa Monica, Calif: RAND Corporation, 2005), pp. 9-38.

Much energy was wasted during the war's early aftermath in parochial fencing between some air force and navy partisans over which Service deserved credit for having done the heavier lifting in Enduring Freedom, with air force advocates pointing to the preponderance of munitions and overall bomb tonnage dropped by the air force and navy proponents countering that it was carrier-based aircraft, in the end, that flew the overwhelming majority of combat sorties and that performed nearly all of the "true" precision LGB attacks. That dispute was totally unhelpful to a proper understanding of what integrated air force and navy strike operations actually did to produce such a quick and lopsided win over the Taliban and Al Qaeda. In fact, it remains a toss-up as to which Service predominated in the precision-strike arena. Arguing over whether navy or air force air power was more important in achieving the successful outcome of Enduring Freedom was about on a par with arguing over which blade in a pair of scissors is more important in cutting the paper. For the first time in the history of joint warfare, Operation Enduring Freedom showed real synergies in air force and navy conduct of integrated strike operations. In addition, for the first time, naval aviators found themselves occupying key CAOC positions ranging from the deputy combined-force air component commander (CFACC) on down.

This process of integration saw a further convergence during the three weeks of major combat in Operation Iraqi Freedom. If the air war over Afghanistan was tailor-made for integrated air force and navy strike operations, the subsequent campaign a year later to topple Saddam Hussein would prove to be no less so. That campaign set a new record for close navy involvement in the high-level planning and conduct of joint air operations and stood in stark contrast to the navy's less gratifying experience 12 years before during Desert Storm, when the overwhelming majority of the staffing of the CAOC's targeting cell was by air force officers, with navy members

Much energy was wasted during the war's early aftermath in parochial fencing between some air force and navy partisans over which Service deserved credit for having done the heavier lifting in Enduring Freedom.

In both cases, carrier air power, long-range bombers, land-based tankers, and land-based fighters were available and ready for CFACC tasking when the time came, and all four force elements were crucial to the timely achievement of the joint force commander's declared objectives.

both too few in number and too junior in rank to influence the day-to-day decision-making. In the end, Operation Iraqi Freedom was a true joint-Service effort involving wholly integrated air force and navy strike operations. As two military historians writing an early synopsis of the war aptly put it, that effort saw "little of the petty parochialism that too often marks interservice relations within the [Washington] Beltway."[6]

In both wars, each Service brought a needed comparative advantage to the fight. In the case of Enduring Freedom, air force bombers flew only around 10 percent of the total number of combat sorties but dropped roughly 80 percent of the ordnance, including the preponderant number of satellite-aided joint direct attack munitions (JDAMs). For its part, although the navy needed the support of air force tankers to be mission-effective, its sea-based strike fighters operating off the coast of Pakistan provided an essential combat capability in a part of the world where the air force both lacked the needed access to operate its fighters most efficiently and remained limited in the number of fighter sorties it could generate even after it finally achieved its needed access. The reason for the latter was the substantially greater distances to Afghanistan from forward land bases in the Persian Gulf that demanded fighter missions lasting as long as 15 hours, which were unsustainable over the long haul.

The performance of air force and navy strike assets during the first two American wars of the 21st century bore ample witness to the giant strides that had been made in the integration of the two Services' air warfare repertoires since Desert Storm. In both cases, carrier air power, long-range bombers, land-

6. Williamson Murray and Major General Robert H. Scales, Jr., USA (Retd.), *The Iraq War: A Military History* (Cambridge, Mass.: The Belknap Press of Harvard University Press, 2003), p. 114.

based tankers, and land-based fighters were available and ready for CFACC tasking when the time came, and all four force elements were crucial to the timely achievement of the joint force commander's declared objectives. The two wars also saw naval aviation fully integrated into the joint and combined air operations that largely enabled the successful outcomes in each case. In addition, they showed increased navy acceptance of effects-based thinking, as well as a common use of the joint mission planning tools that the air force had refined during the decade after Desert Storm. Prompted by the successful experience of Enduring Freedom and Iraqi Freedom, prospective carrier air wing commanders and other rising naval aviation leaders now routinely spend upward of 100 days forward-deployed in CENTCOM's CAOC at Al Udeid Air Base in Qatar for operational planning familiarisation in a senior staff assignment before assuming their new command responsibilities. They also routinely attend the air force's strike planning course at Hurlburt Field, Florida and, after having moved on to post-command billets, its week-long CFACC course at Maxwell AFB, Alabama.

As for other signs of progress toward greater cross-Service integration in strike warfare, there have been steady improvements in joint operations and training between the air force and navy since American combat involvement in Vietnam ended more than three decades ago. For years, naval aviators have routinely taken part in the air force's recurrent Red Flag realistic large-force employment training exercise that first began in late 1975 and that continues to be conducted roughly six times a year within the instrumented range complex north of Nellis AFB, Nevada. Also, the air force's and navy's undergraduate pilot training (UPT) programmes are now fully integrated, with air force officers commanding navy primary UPT squadrons and vice versa. The two Services continue as well to provide exchange officers to each other's line squadrons and flight test units on a regular basis, with a navy lieutenant commander recently assigned to fly the F-22 Raptor fifth-generation air force fighter with the 422nd Test and Evaluation Squadron at Nellis. Similarly, ever since the air force retired its EF-111 electronic warfare aircraft from Service not long after Desert Storm, air force aircrews have routinely been assigned to

full tours of duty as serving aircrew members with the navy's EA-6B shore-based expeditionary squadrons.

Perhaps most constructively of all, the two Services continue to bring their respective forces together in a variety of joint training and experimentation exercises aimed at further honing their interoperability and extracting the most from their synergistic potential when it comes to the conduct of effective strike operations. A good example of such joint involvement in realistic large-force peace-time training occurred during Exercise Valiant Shield '06, a five-day evolution conducted in the vicinity of Guam from June 19 to June 24, 2006. Valiant Shield involved the participation of some 22,000 personnel, 280 aircraft, and 30 ships, including the aircraft carriers USS *Kitty Hawk*, *Abraham Lincoln*, and *Ronald Reagan* and their three embarked air wings. It was the largest joint military exercise conducted in Pacific waters since the Vietnam War and represented the first installment of what will become a regular biennial exercise series involving various US Service branches and communities.

As reflected in the examples outlined above, the overall record of Air Force and navy accomplishment in integrated aerial strike operations since Desert Storm is a resounding good-news story that is a credit to each Service both separately and together. As such, it stands as a clear example of what can be done along similar lines elsewhere, not just in the interface between air and maritime operations, but even more so in the still-troubled relationship between the air force and army (see below) when it comes to the most efficient conduct of joint air-land warfare. This operational integration had to overcome multiple barriers and the most deeply-ingrained resistance to change in both Services. The fact that organisations, especially military organisations, tend to resist rather than embrace change makes the experience all the more remarkable. More encouraging yet, thanks to the guiding role played by individuals in both Services with the right focus and a determination to act on it, there is now a well-ensconced successor generation in place in both the air force and the navy

The two Services continue to bring their respective forces together in a variety of joint training and experimentation exercises.

who grew up as line aircrew members during the formative years of this integration process. Those individuals have since migrated through such mid-level positions as CAOC coordinators, combat plans and operations staffers, and strategy division principals to the more senior flag ranks and positions that will help them ensure that the strike warfare communities in both Services continue to pursue an increasingly common operational culture.

The experience of the air force in its attempts at joint operations with its sister Services in the land warfare community have been considerably more difficult and uneven.

MORE HALTING PROGRESS ON THE AIR-GROUND FRONT

In sharp contrast to the impressive pattern of air force-navy integration in aerial strike warfare since Desert Storm, the experience of the air force in its attempts at joint operations with its sister Services in the land warfare community have been considerably more difficult and uneven. To cite a particularly notable case in point, during the initial planning workups for Operation Anaconda, an army-led effort to bottle up and capture or kill Al Qaeda holdouts in the Shah-i-Kot valley of eastern Afghanistan in March 2002, the failure of the army command tasked with conducting the operation and CENTCOM's land component to enlist the involvement of the air component until it was almost too late nearly resulted in a disaster for the army when its attempted insertion of allied ground troops met unexpectedly fierce enemy opposition and left those troops for a time without adequate air support.

Prompted by an unseemly contretemps that ensued for a time in the early aftermath of that near-debacle when the operation's former commander accused the air force, without foundation, of having failed to provide his embattled troops with adequate close air support (CAS) in a timely manner, the air force's then-Chief of Staff, General John Jumper, initiated a four-star dialogue with his army counterpart, General Eric Shinseki, to get to the bottom of the many misunderstandings on all sides associated with Anaconda and to implement appropriate measures to ensure that such a failure to

There was recurrent friction in air-ground coordination throughout the three weeks of Iraqi Freedom.

communicate between the concerned components would never again needlessly hamper the effective integration of US land and air forces in joint warfare. One direct outgrowth of that high-level inter-Service dialogue was CENTCOM's establishment of an Air Component Coordinating Element (ACCE) headed by Air Force Major General Daniel Leaf and physically collocated at the headquarters of the land component commander, Lieutenant General David McKiernan, in ample time for the execution of Operation Iraqi Freedom.

In his capacity as head of the ACCE, General Leaf was formally empowered to represent the air component as an extension of the CFACC, then-Lieutenant General Michael Moseley, and not merely to serve as a neutral "liaison" between the air and ground component commanders. His two-star status put him on an equal footing with General McKiernan's principal deputies for operations, intelligence, and other combat functions, which ensured that General Moseley's perspective as the CFACC would be routinely accorded full and proper attention during land-component staff meetings and briefings. In comments after the major combat phase of Iraqi Freedom successfully ended, General Leaf expressed the view that the campaign experience had strongly validated the ACCE concept as a means of better facilitating air-land integration. In particular, he remarked that the presence of the ACCE "allowed rapid resolution of areas of contention [and] competing priorities … that had been missing in other operations in the last 15 years or so."[7]

Still, there was recurrent friction in air-ground coordination throughout the three weeks of Iraqi Freedom. Despite the significant improvement in organisation for closer integration between the air and land components noted above, the classic and familiar discontinuity between air force and army thinking with respect to how best to neutralise an enemy's ground forces nonetheless reared its head repeatedly during the early days of the campaign,

7. Elaine M. Grossman, "General: War-Tested Air-Land Coordination Cell Has Staying Power," *Inside the Air Force*, March 12, 2004, pp. 13-14.

with air force airmen in the CAOC arguing for using fixed-wing air power to draw down enemy force capability to the greatest extent possible *before* allied ground units moved to direct contact, and army protagonists, for their part, insisting that the main purpose of the US Army is to defeat the enemy's army and that early ground-force engagement with the enemy was accordingly the ideal mode of operations. Such thinking clearly underlay the army's seemingly irresistible urge to pursue its ultimately abortive attempt at conducting a deep-attack assault against a Republican Guard troop concentration with AH-64 Apache attack helicopters. More important, it was the main explanatory factor behind some significant lost opportunities for CENTCOM to engage Iraqi ground forces in a most timely and effective way as a result of a continuing struggle between the land and air components over the ownership and control of the battlespace.

Such thinking clearly underlay the army's seemingly irresistible urge to pursue its ultimately abortive attempt at conducting a deep-attack assault against a Republican Guard troop concentration with AH-64 Apache attack helicopters.

On the first count, in a move reminiscent of Operation Anaconda that was almost completely uncoordinated with CENTCOM's air component, the V Corps commander, Lieutenant General William Wallace, approved a staff request to launch an Apache deep-attack mission on March 23, 2003, with the assigned objective of engaging three brigades of the Republican Guard's Medina Division that was deployed south of Baghdad. During the brief course of the attempted attack, all but one of the 30 participating Apaches sustained damage from enemy gunfire. During their hasty retreat from the target area, two barely avoided a mid-air collision. In the end, the 11th Aviation Regiment got badly shot up and experienced two aircraft losses (one with the crew captured), all for fewer than a dozen Iraqi vehicles successfully attacked.

Another shortcoming in air-ground coordination that was repeatedly spotlighted throughout the three-week campaign had to do with doctrinally-

Another shortcoming in air-ground coordination that was repeatedly spotlighted throughout the three-week campaign had to do with doctrinally-imposed limitations on joint fire-support delivery, particularly with respect to the placement of the fire support coordination line (FSCL).

imposed limitations on joint fire-support delivery, particularly with respect to the placement of the fire support coordination line (FSCL), a recurrent point of contention between the air and land components that needlessly inhibited the most effective application of joint fires. To start with some basics, the FSCL was the primary fire-support mechanism for dividing CENTCOM's battlespace between the land and air components. Any terrain on the far side of the FSCL was essentially a free-fire zone for the air component, since there could be no possibility of friendly troops coming into contact with enemy ground forces in that portion of the battlespace. All kill boxes on that side of the FSCL were open to attacks from the air. In contrast, the terrain on the *near* side of the FSCL was primarily the land component commander's battlespace. Kill boxes that lay within it were closed to attack from the air unless air controllers assigned to army ground units expressly opened them for attacks under the control of airborne or ground terminal attack controllers.

During the initial allied ground advance into Iraq, the FSCL was extended by the land component to more than 130 km ahead of the line of attacking ground forces. That had the inevitable byproduct effect of severely stressing needed tanker support for airborne strike aircraft by extending the need for such support that much farther north. Similarly, to facilitate the planned Apache assault discussed above, the land component moved the FSCL forward dozens of miles in front of coalition forces. That decision, said General Leaf, "cost us [the air component], basically, a full night of fixed-target strikes inside the FSCL. We—the entire coalition team—had not hit our stride in achieving the command and control required to operate in volume effectively inside the fire support coordination line."[8]

8. Rebecca Grant, "Saddam's Elite in the Meat Grinder," *Air Force Magazine*, September 2003, p. 43.

A close trust relationship was forged between the air component and the First Marine Expeditionary Force (1 MEF).

In the case of joint kill-box interdiction and CAS planning on behalf of V Corps, the coordination in ATO development was conducted through the Army's Battlefield Coordination Detachment (BCD) in the CAOC. FSCLs were positioned farther than the usual distances ahead of the forward line of friendly troops because of an anticipated rapid rate of friendly advance. As an assistant to General Leaf later recalled on this point: "Every day, General Leaf would arrange for the FSCL to be pulled a little back, but every night the army majors would throw it far out again."[9] Part of the problem created for maximally-responsive air employment by this impacted arrangement was that the common geographic reference system based on kill boxes and key pads, although amply proven as an effective alternative to the FSCL a dozen years earlier in Desert Storm, had never been formally ratified in joint doctrine and accordingly was not duly honoured by army operations personnel in joint tactical contingency planning. For its part, the FSCL continued to be a familiar and time-worn artifact signifying army ownership and control of joint battlespace, even though it had become an anachronism for most circumstances of fluid air-land combat.

In contrast to this sometimes dissonant interface between the air component and the army's players in the land component, a close trust relationship was forged between the air component and the First Marine Expeditionary Force (1 MEF) with respect to the apportionment and use of marine corps aviation as the planning workups for Iraqi Freedom got under way. In that relationship, General Moseley, as the CFACC, retained ultimate authority over the allocation of marine fixed-wing aircraft, but he agreed to use those aircraft principally to support marine operations on the ground. He further promised to give the marines any additional air support that they might require from air force and navy strike assets. This trust relationship was facilitated by 1 MEF's provision

9. Michael Knights, *Cradle of Conflict: Iraq and the Birth of the Modern US Military* (Annapolis, Md: Naval Institute Press, 2005), p. 297.

of a highly-qualified marine aviator as a member of General Moseley's CAOC staff, who helped educate air force airmen as to what marine corps operational requirements were and also as to what marine aviation could contribute to the joint and combined air war.[10]

Indeed, in 1 MEF's area of operations, General Moseley so trusted the Marine Air-Ground Task Force (MAGTF) approach and the marines who were implementing it that he allowed 1 MEF to control the airspace above its immediate area of operations, as a result of which 1 MEF created its own direct-support ATO for execution by the 3rd Marine Aircraft Wing. For deep interdiction within this construct, kill boxes were opened and closed by the Marine Tactical Air Operations Centre and Tactical Air Control Centre (TAOC/TACC). For close interdiction inside the FSCL, TAOC terminal control was not required. For closer-in attacks, the Marine Direct Air Support Centre (DASC) provided terminal attack control. As recalled by the chief of the CAOC's strategy division, the DASC with 1 MEF was able to integrate more fires into the battlespace for CAS and interdiction than was the Air Support Operations Centre (ASOC) assigned to the army's V Corps. Particularly during the initial days of combined air-land operations, the ASOC was only able to integrate an average of six combat sorties into the fight per hour, whereas the DASC was able to integrate twice that amount of air support in the same length of time. Later, as joint air-ground operations hit their stride, the ASOC was able to integrate CAS sorties more efficiently.[11] Once that occurred, General Leaf noted that FSCL placement became less an issue as the air and land components succeeded in improving the coordination of their operations within kill boxes.[12]

As if to bear out the greater efficiency of the marine approach to managing air and ground fire support in common battlespace, at the height of the three-

10. Jay A. Stout, *Hammer from Above: Marine Air Combat Over Iraq* (New York: Presidio Press, 2005), pp. 16-17.

11. Colonel Mason Carpenter, USAF, "Rapid, Deliberate, Disciplined, Proportional, and Precise: Operation Iraqi Freedom Air and Space Operations—Initial Assessment," unpublished paper, p. 14.

12. Grant, n.8, p. 43.

day sandstorm when the land component's forward movement had all but ground to a halt, the land component commander finally pulled in the FSCL to just beyond the Euphrates river, opening up as many kill boxes as possible for the CFACC to work. At long last, a true air-ground joint concept of operations emerged for the first time, producing, as Michael Knights commented, "something akin to the arrangement that had been in place in the MEF sector throughout the war. The MAGTF concept underpinned the difference, allowing US Marines (and their subordinate British division) to fight as a true air-land partnership rather than as a ground and air component trying to get out of each other's way."[13]

Eventually, army assessors came to realise the opportunity cost of their classic doctrinal compulsion in situations in which the land component lacked the needed situation awareness to conduct deep attacks inside the FSCL with its own organic fire-support assets.

Eventually, army assessors came to realise the opportunity cost of their classic doctrinal compulsion in situations in which the land component lacked the needed situation awareness to conduct deep attacks inside the FSCL with its own organic fire-support assets. As the 3rd Infantry Division's after-action report frankly acknowledged on this key point: "The US Army must redefine the battlespace based on our ability to influence it."[14] The report went on to admit that "the FSCL was 100 km beyond the range of standard munitions from our M109A6s and M270s. This created a dead space between the area that the army could influence and the area shaped by the CFACC. The placement of the FSCL was so far in front of the forward edge of the battle area that neither divisional nor corps assets could effectively manage the battlespace."[15]

Despite such occasional instances of intercomponent friction at the margins, however, CAS provision was typically smooth throughout the major

13. Knights, n.9, p. 303.
14. US Army 3rd Infantry Division, *Third Infantry Division (Mechanized) After Action Report: Operation Iraqi Freedom*, (Fort Stewart, Ga., 2003), p. 108.
15. Knights, n.9, pp. 297-298.

The concurrent and mutually-supporting application of air and land power in the same battlespace in Iraqi Freedom eventually bespoke a major advance in the conduct of joint warfare.

combat phase of Iraqi Freedom, irrespective of the colour of uniform that delivered it. As General Moseley remarked during a briefing to the media on April 5, 2003: "If you check into the CAS stack, you may be working with a marine in an F-18 or a navy crew in an F-14 or an air force pilot in an A-10. You won't know the difference. You'll just know the call sign and the location. So I think that's another wonderful testimony to joint training, joint doctrine, joint CAS, and being able to work the command and control to get the airplanes up there." As for the crucial importance of simply getting the job done right rather than tugging and hauling for a fair share of credit for having done it, Moseley added: "As the air component commander, I'm not sure I care how we kill the [enemy] tank. I just want the tank to die so my army captain doesn't have to face it…. There will be someone somewhere along the way [who] will want an accounting scheme of who killed what vehicle, but right now that's not important to us and it's not important to that lieutenant or captain."[16] Thanks in large part to these organisational measures, the air component's delivery of CAS throughout the major combat phase of Iraqi Freedom earned high marks from both army and marine corps consumers of the Service.

In sum, the concurrent and mutually-supporting application of air and land power in the same battlespace in Iraqi Freedom eventually bespoke a major advance in the conduct of joint warfare. As General Leaf put it, Iraqi Freedom represented the first time that the US armed forces had conducted large-scale combat with the air and land components working side by side "as equals," as a result of which the air and land components "achieved conceptual interoperability…. This was not [only] communications and software. We really had concepts linked. The real key was the collaborative planning at a

16. "Coalition Forces Air Component Command Briefing," Washington, DC, Department of Defence, April 5, 2003.

senior level." General Leaf added: "We used [the mix of force elements that was] most appropriate. Sometimes ground preponderance, other times the air, other times in the middle. It was part of my job." [17] The US Department of Defence later attributed the success of the three-week campaign largely to this unprecedented joint-force integration among the four Services. In commenting on that accomplishment, Admiral Edmund Giambastiani, the commander of US Joint Forces Command (JFCOM) at the time, noted that arriving at such insights as the importance of joint integration, adaptive planning, and speed in staying ahead of the enemy's decision cycle "was actually not all that easy. They had to be proven in conflict" and required "a significant change in US Service culture to accept the message that the power of the joint force is far greater than that of any individual Service."[18]

UPS AND DOWNS IN THE COIN ARENA

As was the case during the major combat phase of Iraqi Freedom, CENTCOM has likewise experienced recurrent inefficiencies in joint air-land operations in its subsequent COIN wars in Iraq and Afghanistan. To review the positive aspects first, much of the effectiveness of the air contribution to recent COIN operations in Iraq has been due not just to the equipment and tactics employed, but even more so to astute measures undertaken by combatants in all Services to bridge procedural seams and doctrinal gaps between such multi-Service command entities as the army-centric joint fires and effects cell (JFEC) of Multinational Corps—Iraq (MNC-I), the air force's collocated ASOC, the marine corps' separate DASC, and the air component's CAOC at Al Udeid Air Base in Qatar. Continuously improving lash-ups between and among these overlapping entities have helped the joint team operate in a smoother and more integrated way than might otherwise have been the case.

By far the majority of this integration takes place within MNC-I's JFEC, which directs fires, performs effects assessments, and oversees current and

17. Tim Ripley, "Closing the Gap," *Jane's Defence Weekly*, July 2, 2003, pp. 25-26.

18. John Liang, "JFCOM Commander Outlines 'Good' and 'Ugly' in Iraq Lessons Learned," *Inside the Pentagon*, March 25, 2004, p. 15.

future targeting. The adjacent ASOC, also located at MNC-I headquarters and staffed by air force airmen, works with the JFEC to coordinate CAS operations throughout Iraq on behalf of both MNC-I and the CAOC. As provided for in joint doctrine, the ASOC continues to report to the CFACC within air-component channels, but the army brigadier general in charge of the JFEC typically includes it completely in all JFEC decision-making. For its part, the ASOC continuously monitors the joint air request net that connects all assigned tactical air control parties (TACPs) at the battalion, brigade, and division level. It also services incoming air support requests (ASRs) in response to troops-in-contact (TIC) events as they occur. Since the traditional FSCL used as a CAS management tool in conventional operations does not apply in the fluid COIN situation in Iraq, kill boxes are used instead as the standard frame of reference, with the ASOC continuously moving available air assets to specific kill boxes throughout the country as tasking needs of the moment may require. This arrangement represents but one of many citable examples of the sorts of efficiencies that have been and can be achieved through both professional interdependence and the personal trust relationships that have evolved over time among the various multi-Service players.

It bears stressing here that ASRs from engaged army and marine corps field commanders tend to be highly disciplined and well justified by the tactical situation. In the current fight in Iraq, ASRs are received by the CAOC at all hours of the day in connection with as many as ten or more concurrent ground movements that might include battalion-level clearing operations, searches for insurgent weapons caches and bomb-making facilities, attempted hostage rescues, and direct-action attacks on insurgent or Al Qaeda leaders.[19] Almost all TIC declarations elicit timely air support responses, with the main source of friction and delay being occasional ground-to-air communications difficulties. The ASOC in Baghdad works closely with the CAOC at Al Udeid to minimise ASR response times. In 2004, when seams and wrinkles in the process were still being ironed out, the ASOC succeeded in reducing the average combat

19. Thom Shanker, "Special Operations: High Profile, But in a Shadow," *New York Times*, May 29, 2007.

information cycle time from 20-25 minutes during the summer to six or seven minutes by the time the second battle of Fallujah cranked up in November.

A revealing illustration of the joint air tasking process outlined above occurred in January 2005 when MNC-I's planning emphasis shifted from direct action against insurgents to supporting the Iraqi election process and determining an associated air presence plan for Iraq. In this evolution, the CAOC took the lead in designing and advocating the air presence plan. Some army MNC-I staff at first were said to have viewed this initiative as simply a CAOC attempt to create a mission for the air component. They accordingly directed that allied aircraft remain out of sight throughout the voting process. The MNC-I commander, however, forcefully countermanded that staff directive. With that amended commander's intent now firmly in control of unfolding events, the closely-integrated CAOC, JFEC, and ASOC team proceeded to reach down to brigade- and division-level fire support elements and to their assigned TACPs for suggested inputs from the field. The involved subordinate commands also designated specific villages that would require air servicing, mapped out air presence ingress and egress routes, and determined desired overflight altitudes depending on the on-scene commanders' desires either to deter insurgent activities or reassure the population as changing circumstances might require. With that guidance in hand, the CAOC battle staff then determined required tanker tracks, allocated tankers to them as appropriate, and surged strike assets into the designated areas of operations during the week leading up to the election. Lending further support to the seamlessness of this process was the army's BCD in the CAOC, which represented the land component there just as the ASOC represented the air component at MNC-I headquarters in Baghdad. Much of the cross-Service harmony that distinguished this force-management process was directly attributable to the accumulated experience and mutual trust among the key protagonists in the air and land components who had worked closely together over time.

That said, the use of air power in the ongoing COIN wars in Iraq and Afghanistan has not been without recurrent friction and inefficiencies ensuing

The use of air power in the ongoing COIN wars in Iraq and Afghanistan has not been without recurrent friction and inefficiencies ensuing from such abiding factors as differences in Service culture, intercomponent struggles over the ownership and control of air assets.

from such abiding factors as differences in Service culture, intercomponent struggles over the ownership and control of air assets, and resultant failures at times on CENTCOM's part to achieve the greatest possible unity of effort in joint-force application. On the first count, the air force has long insisted as a matter of tried and proven Service doctrine that scarce joint-force air assets should be centrally controlled by the CFACC in order that they may provide the greatest possible combat leverage and utility throughout the theater. The army, in marked contrast, has been inclined instead to stipulate, as its most recent COIN manual flatly reiterates, that "at the tactical level, air support requires a decentralized command and control system that gives supported units immediate access to available combat air assets and to information collected by air reconnaissance and support assets."[20] This sharp divergence in operating preferences has made for a systemic challenge in integrating the CAOC into day-to-day joint-force planning when its senior leaders characteristically approach air tasking issues from the top down, with a predominant focus on theatre-wide needs and concerns, whereas land-warfare planners, for their part, tend to view air-asset allocation priorities instead from the bottom up, with an all but exclusive fixation on here-and-now tactical challenges at the small-unit level.

To be sure, some of this dissonance emanates from the fact that airmen have traditionally been trained for major combat rather than for COIN operations and from the associated fact that CAOCs, as currently constituted, have been designed to support high-intensity operations more than geographically-distributed COIN situations. As a result, air force airmen face a recurrent conundrum in adapting to the ground-centric fight that is the only one they now have rather than coping with

20. *The US Army/Marine Corps Counterinsurgency Field Manual* (Chicago and London: University of Chicago Press, 2007), p. 366.

the proverbial "big war" in which they may some day be central and perhaps decisive participants. At the same time, the overwhelming dominance of the land component in the United States's two ongoing COIN wars, with all of the cultural baggage that land warriors inevitably bring to joint operations, has often meant in practice that the air component is essentially regarded and treated as an organic "air corps" by the land component, with air power not supposed to be anything *but* reactive to ground-force needs of the moment and with the CAOC regarded more as a "help desk" than as an integral player on the joint team.

Air force airmen face a recurrent conundrum in adapting to the ground-centric fight that is the only one they now have rather than coping with the proverbial "big war".

Principal among the many manifestations of this often frustrating reality is the fact that despite the presence of an ACCE at the headquarters of the Multinational Force-Iraq (MNF-I) in Baghdad, CENTCOM's air component and the CAOC are not really integrated into MNF-I's day-to-day strategic planning, insofar as such planning routinely takes place at all. As a result, air power continues to play basically a reactive role in Iraq, principally by way of responding to ASRs submitted by lower-level ground-force staffers that do not reflect underlying strategic thought but merely reflexive demands for target servicing. Moreover, since army commanders and planners typically are not deeply conversant with air power's full breadth of potential offerings, they often will ask for a particular item of equipment, such as a sniper infrared targeting pod, rather than for broader air-component missions, capabilities, or desired effects. The ultimate result, all too often, is combat aircraft being put on overhead stations merely where some ground-unit commander asks for them to be, not where they could actually be killing insurgents.

A related source of friction in air-land operations in the ongoing COIN wars in Iraq and Afghanistan is the continued, and seemingly relentless, tugging and hauling that goes on between the land and air components over the tactical control of all varieties of joint air assets. One sees this most visibly in the issue of unmanned aerial vehicle (UAV) operations by

the different Services. By early 2005, the air force, army, and marine corps together were operating more than 750 UAVs over Iraq and Afghanistan, yet without an overarching and coherent command-and-control arrangement to coordinate their respective activities in such a manner that, as former Air Force Chief of Staff General Jumper put it, "we have them [all] in the right place at the right time."[21]

According to joint doctrine, the CFACC, as a joint force's designated airspace control authority, has both procedural and positive control methods available to him to ensure proper airspace deconfliction. Positive control is used whenever aircraft are equipped in such a way as to allow air traffic controllers to identify and communicate with all aircraft operating in joint-use airspace. Alternatively, procedural control is used in specific blocks of airspace in which the absence of such equipment does *not* allow controllers to track an unmanned aircraft. The latter method, according to an air force expert, in effect "blocks off airspace for use by a single aircraft, since [that aircraft] is unable to be seen by and/or communicate with the necessary air traffic controllers. This restrictive procedure results in the highly inefficient use of airspace" and "restricts maneuver."[22] Among other things, such restrictive airspace management rules have occasioned more than a few instances in which air force and navy fighters could not respond immediately to insurgent mortar attacks because an army or marine corps UAV happened to be operating in the same area, preventing the fighters from entering it in a timely and mission-effective way.[23]

Air force and navy fighters could not respond immediately to insurgent mortar attacks because an army or marine corps UAV happened to be operating in the same area.

For its part, the air force—as the most authoritative articulator of air-component interests—has adamantly insisted that all medium- and high-

21. Lisa Kim Bach, "Air Force Boss Foresees UAV Program at Indian Springs," *Las Vegas Review-Journal*, March 10, 2005.

22. Colonel Robert Marlin, USAF, "Clarification on UAVs," *Defence News*, June 18, 2007, p. 60.

23. Lolita C. Baldor, "Military Services Lock Horns Over Control of Drone Aircraft," *San Diego Union-Tribune*, July 6, 2007.

altitude UAVs (that is, those that operate above 3,500 ft) should, for a number of good operational reasons, be controlled jointly (that is, by the CAOC) rather than by the individual Services that maintain them. First, as was recently explained by the Air Force's Deputy Chief of Staff for Intelligence, Surveillance and Reconnaissance, Lieutenant General David Deptula, "the result would be that intelligence from UAVs would be distributed to the greatest number of troops on the ground, sea, and in the air" and not just to the specific ground unit that happened to wield tactical control over the asset.[24] A second, and arguably even more compelling, basis for the air component's insistence on joint (i.e. CAOC) control of UAVs operating above 3,500 ft is the absolute requirement for safe airspace deconfliction. The former chairman of the Joint Chiefs of Staff, Marine Corps General Peter Pace, agreed in 2007 that with more than 700 UAVs operating over Iraq alone at the time, a better airspace deconfliction mechanism was badly needed, as was a more rational allocation of communications bandwidth among the Services.[25] Yet the army and marine corps continue to resist CAOC initiatives toward that end that would require them to relinquish tactical control of their UAVs. The jury remains out on how this still-festering problem will ultimately be resolved at the most senior command levels within MNF-I and CENTCOM.

The army is proceeding aggressively with the acquisition and forward deployment, at considerable cost, of its own organic Warrior UAVs that are all but carbon copies of the air force's RQ-1 Predator.

Not only that, the army is proceeding aggressively with the acquisition and forward deployment, at considerable cost, of its own organic Warrior UAVs that are all but carbon copies of the air force's RQ-1 Predator and that perform essentially the same functions, only in the narrow service of their individual army units at the battalion level and below rather than for the joint

24. Lieutenant General David A. Deptula, "Of Buying and Flying Those Pilotless Planes," letter to the editor, *New York Times*, April 22, 2007.

25. John M. Doyle, "Pace Says Pentagon Panel Looking into UAV Duplication," *Aerospace Daily and Defence Report*, May 10, 2007.

force as a whole. Apart from the needlessly expensive and duplicative nature of this activity, it merely adds to the existing airspace deconfliction problem, particularly at lower altitudes. Of that problem, the former CFACC, Lieutenant General Walter Buchanan III, in 2005 outlined a nightmare scenario: "My fear is the day will come when we have a C-130 full of troops and there will be [an Army] Scan Eagle, a Pioneer, or whatever [that] is going to come through the cockpit and take out a C-130 because we did not [properly] deconflict."[26]

In one offsetting good-news story, such divisive tendencies on the part of the two Services that make up CENTCOM's land component were resoundingly overcome by a collective sense of overarching need in mid-2004 during the planning workups for the second battle of Fallujah, in which one knowledgeable airman reported that the joint integration of fires would come to confront its "sternest test."[27] The going-in problem in this instance was that the 1st Marine Division and its attached DASC, which together would bear the brunt of the upcoming urban combat, lacked both a common doctrinal foundation with the joint Army-Air Force JFEC/ASOC/CAOC team described above and any past experience in working with army and air force combat assets. The problem was further exacerbated by the placement of the parent 1 MEF's operating boundaries south and west of Baghdad, which had the effect of creating a seam directly between the air force's ASOC and the marine corps' DASC in the busiest and most congested air operating area in central Iraq between Baghdad and Fallujah. Earlier during the summer of 2004, as deconfliction problems arose in connection with air support to coalition operations against the cleric Muqtada al-Sadr and his militia's uprising in Najaf, the DASC, ASOC, and CAOC had hammered together an altitude-based coordination scheme that was sufficient for a relatively small-scale engagement. There was widespread scepticism in all quarters, however, with respect to whether a similar low-altitude cap on marine-controlled air activity

26. Quoted in Marc V. Schanz, "Air Lessons from Fallujah," *Air Force Magazine Online*, October 27, 2005.

27. Colonel Howard D. Belote, USAF, "Counterinsurgency Air Power: Air-Ground Integration for the Long War," *Air and Space Power Journal*, Fall 2006, p. 58.

would work for the more demanding challenge presented by Fallujah.

The core issue here was that the senior marine air officer in the DASC insisted, with compelling force, that he needed control over *all* air activity above and around Fallujah, given the fact that closely-integrated marine air and ground force employment would predominate in that battlespace. For his part, the air force ASOC director replied, with equally compelling countervailing force, that, as recalled by a key participant, in order "to manage the air war throughout the rest of the country—to prevent insurgent attacks elsewhere from drawing combat power away from the main effort—as well as to adequately support the Fallujah fight and enable the CFACC to fulfill his responsibilities as airspace control authority for the entire area of operations, the ASOC needed complete visibility into the DASC's fight."[28] After months of often tense back-and-forthing over this issue, thanks in large measure to a steadily growing mutual trust relationship between the involved marine corps and air force principals, a deal was finally struck in which the marine air operations officer was cleared by the CFACC at the time, Air Force Lieutenant General Buchanan, to manage from the 1st Marine Division command post (with the assistance of a joint air-support liaison team directly at his side) all rotary- and fixed-wing sorties within 25 km of Fallujah and Ramadi, with the aerial fires controlled tactically by a mix of marine, navy, and air force joint terminal attack controllers within the city of Fallujah. Outside that agreed circle, the ASOC controlled a panoply of aircraft that eventually responded to 81 TIC declarations during the most intense two weeks of combat.

The plan ultimately agreed to, by an informed air force account, "was not a lowest-common-denominator compromise" but rather a carefully thought-out arrangement that was "based on the twin pillars of unity of command and transparency" and that "combined the best of two differing approaches to joint fires." In the ensuing arrangement, "the DASC and the MARDIV's [Marine Division's] operations officer for air controlled all aircraft that entered Fallujah but gave the ASOC unfettered access to all its network servers and

28. Belote, Ibid.

chat rooms, providing liaison officers around the clock and allowing ASOC officers and technicians to move air assets in anticipation of MARDIV requirements."[29] In the end, according to this account, "the Marines' DASC, Baghdad's ASOC, and the CAOC in Qatar jointly managed an air war that facilitated success in Fallujah."[30]

An unfortunate downside aspect of this transitory success story, however, is that once granted this exceptional measure of temporary control over marine air assets by the CFACC for the express needs of the impending Fallujah fight, the marines never gave it back after the momentary requirement for it went away. To this day since November 2004, the marines have continued to conduct, in effect, their own private air war out of Al Asad Air Base in the Iraqi western desert over which the CFACC has no tactical control.[31] Part of the explanation for the persistence of this violation of long-standing joint doctrine and practice is that the current CFACC, Lieutenant General Gary North, reports to the overall joint force commander rather than to the more local MNF-I commander. Moreover, although MNF-I has an attached ACCE, the principal war-fighting command in Iraq remains almost totally "green" in its personnel make-up and lacks both an air component and significant joint representation. Finally, with MNF-I's day-to-day operations planning conducted mostly at lower levels, it is doubly difficult for the CAOC to insinuate itself into that process in a significant way when it is physically so far removed from MNF-I headquarters.

Since November 2004, the marines have continued to conduct, in effect, their own private air war out of Al Asad Air Base.

With respect to the ongoing COIN war in Afghanistan, cross-Service cooperation has improved immensely in comparison to the plagued past

29. Ibid., pp. 58-59

30. Ibid., p. 63.

31. Conversations with CAOC staff, Al Udeid Air Base, Qatar, April 23, 2007. air force airmen readily admit that marine aviators are exceptionally competent at integrated air-ground command and control but note also that they have a smaller span of control than the CAOC, are more tactical in their thinking, and do not concern themselves with the theatre-wide deep battle.

experience of the earlier-noted Operation Anaconda in March 2002, when the army-dominated Combined Joint Task Force (CJTF) Mountain (which, in fact, was "combined" and "joint" in name only) failed to include the air component in its planning until the last possible moment and came close to producing a catastrophic outcome for itself as a result. In more recent years, combat operations in Afghanistan have involved a full-up ASOC that is under the operational control of the CFACC but is embedded with the army-centric CJTF staff, along with a thriving ACCE to represent the CFACC to the army CJTF commander. As for the downside, however, in marked contrast with the practice that prevailed during the major combat phase of Enduring Freedom in 2001 and 2002, in which the CAOC developed a daily master air attack plan and an ATO that proactively assigned targets to support the CJTF commander, current air operations in Afghanistan, as in Iraq, have the CAOC now focussed mainly on reactively servicing ASRs from friendly ground units for on-call CAS and sometimes for on-call airlift. In both Afghanistan and Iraq, the CAOC's practice continues to reflect the airman's preference for centralised planning and decentralised execution, whereas the development of daily courses of action by the land component typically reflects an approach in which subordinate commanders are freed to exercise initiative within their understanding of the commander's intent and in which major operational efforts are typically started as low as at the company level.[32]

As a result of this contrast in approaches to mission planning, sometimes the right hand is unaware of what the left is doing with respect to air operations. For example, as late as the summer of 2005, combat aircrews arriving on station overhead to support engaged or engaging friendly ground units in Afghanistan did not know who else was involved in the ongoing air-support arrangement, where the CAP stations of those additional aircraft might be positioned, what their altitudes were, and myriad other considerations that might help an air mission commander deconflict the involved air assets. This persistent shortcoming suggests a continuing need for better integration of the

32. Colonel Michael W. Isherwood, USAF (Retd), "Five Years After Operation Anaconda: Challenges and Opportunities," *Joint Force Quarterly*, Issue 47, 4th Quarter 2007, p. 142.

There remain systemic obstacles in the path toward optimal jointness that continue to make further progress anything but certain.

air component into CJTF operations planning. The encouraging news here is that the air component's in-place and active ASOC, ACCE, and Control and Reporting Centre allow the CFACC and his staff in principle to interact better at all levels in Afghanistan. The obvious downside is, as one airman with first-hand experience in that setting recently reported, that this process must continually "reconcile the realities that the air component planning is top-down while the land forces planning will be bottom-up."[33]

WHAT DOES THIS RECENT EXPERIENCE TELL US?

In my paper delivered at this forum three years ago, I argued that American combat forces had performed ever more effectively in joint warfare since Vietnam, thanks in part to inescapable operational necessity and in part to the willingness of the involved joint force commanders to rise above narrow Service interests in employing the most goal-maximising strategies. I further noted, however, that the countervailing pressures of Service parochialism had by no means gone away and that as a result, this laudable progress had been uneven and often turbulent. Finally, in reflecting on why harmonious joint-force employment has continued to be so problematic, I suggested that there remain systemic obstacles in the path toward optimal jointness that continue to make further progress anything but certain. Because of those obstacles, I added, all the agreed formal joint doctrine, joint operating manuals, and joint tactics, techniques and procedures in the world will never, in and of themselves, ensure the achievement of full jointness in military operations. On the contrary, the only effective guarantee of that noble goal will be the continued inculcation of mutual respect and trust among the involved component commanders and a determination by joint force commanders to place objective mission needs above parochial instincts born of their Service upbringing.[34]

33. Isherwood, Ibid., p. 145.

34. Benjamin S. Lambeth, "Jointness in Air Warfare: The American Experience," paper prepared for

Those propositions, I believe, have been amply borne out by subsequent American experience as reflected in the varied illustrations, both positive and negative, that were offered in the preceding discussion. To begin with, those instances of arrested progress along the road to full jointness well attest to the essential correctness of retired US Air Force General Charles Horner's observation that "jointness would seem to be simple to achieve when in fact it is not." Although the formulation and application of the most rational approaches to the challenges facing today's joint force commanders would appear, at bottom, to be a matter of mere common sense, that quest unfortunately continues to be frustrated by such systemic obstructions identified by General Horner as the persistent influence of often inappropriate Service doctrines, the force of habit born of years of incessant Service acculturation, honest ignorance of better alternatives, and the natural inclination of key players to opt for assured ownership of assets rather than to bank on blind trust in joint partners to do the right thing in the joint force's interests. Such examples as the abortive V Corps attempt to stage a go-it-alone Apache helicopter assault against a forewarned enemy ground-force contingent and the recurring intercomponent tug-of-war over the placement of the FSCL during the major combat phase of Operation Iraqi Freedom, as well as the continuing intercomponent contest for ownership and control of UAV operations and the marine corps' insistence on conducting autonomous air operations in the ongoing COIN war in Iraq, offer living testaments to the power of these negative influences as barriers along the road to full jointness.

The clear success story of air force-navy integration in strike warfare since Desert Storm offers convincing testimony to such factors conducive to jointness identified by General Horner.

By the same token, the clear success story of air force-navy integration in strike warfare since Desert Storm offers convincing testimony to such factors conducive to jointness identified by General Horner as solutions-oriented

the 11th International Air Strategy Symposium on the subject of "Jointness: History, Command and Control, Targeting, and Operations," Korea Air University, Daejeon, South Korea, September 7-8, 2005.

The overarching challenge now confronting all concerned parties is to take the next step toward truly seamless joint operations, namely, "the move from Service interoperability to Service interdependence".

joint-force organisational arrangements, the cumulative seasoning and insights provided by repeated joint exercises both in peacetime training and in combat, and the inherent power of successful experience as an incentive for continuing to apply proven solutions that obviously work. That, along with the above-cited examples of harmonious joint air-land operations in Iraq since 2003, bears witness to two more of General Horner's informed axioms: (1) the extent to which military operations will be genuinely "joint" will hinge largely on the willingness of senior on-scene commanders to do the right thing by employing "the optimum blend of force capabilities to achieve success", and (2) "the more dire the situation, the greater [will be] the motivation for leaders to consider alternative forces and strategies that lead to true 'joint' operations."[35]

Surely there is room for more creative thought about best ways of achieving greater synergies between and among joint forces than merely continued point-counterpoint arguments about the relative value of the air and land components. Among the first of any such touchstones of better thinking should be a collective *a priori* recognition that (1) no single component or force element can routinely be expected to "go it alone" in joint operations; (2) at least in some circumstances, the air component may be the swing factor in determining the outcome of *specific events*; and (3) joint force commanders should, in all instances, let mission needs determine which force elements will predominate in any given situation.

In the interest of encouraging further progress along the rocky road toward full jointness, US Air Force Lieutenant General David Deptula

35. General Charles A. Horner, USAF (Retd), "Joint Operations: An Air Component Commander's Perspectives," paper prepared for presentation at the 14th International Air Strategy Symposium on the subject of "Jointness: A War Experience" held at Korea Air University, Daejeon, South Korea, September 25, 2008.

recently suggested that the overarching challenge now confronting all concerned parties is to take the next step toward truly seamless joint operations, namely, "the move from Service interoperability to Service interdependence."[36] Good Service interoperability was all but perfectly epitomised by the example discussed above of mature air force-navy integration in strike warfare. For full-fledged Service and component *interdependence* to emerge, however, the existing compulsion on the part of all protagonists toward jealously-guarded ownership of assets and assumed prerogatives, on the premise that "what's mine is mine and what's yours is joint," will need to yield eventually to a willingness on the part of all joint-force components to trust the promised offerings of their partners in other components. That trust, moreover, will have to be earned and validated the hard way—by repeated banner performance by those joint-force elements in which such faith and trust would be invested.

In pursuing this worthy goal of Service interdependence, the various interested players might do well also to consider that the continuous back-and-forthing that has gone on in the inter-Service contretemps over which force element in joint operations should be designated as "supported" and which as "supporting" has reflected a decidedly unhelpful way of thinking about the proper relationships among the affected components. Granted, the "supported/supporting" construct has an important basis in delineating formal component responsibilities in joint operations. As such, it will always figure to some extent in intercomponent division-of-labour deliberations. Yet from a more overarching strategic perspective, a more solutions-oriented approach would appear to be one that deemphasises the question of who is "supported" or "supporting" and that focusses instead on unity of effort in getting the task at hand accomplished as efficiently and effectively as possible. Categorical assertions such as the parochial claim that even with today's air-component capability improvements, "air power plays largely a supporting role in fighting insurgency and terrorism" beg the overarching question of

36. Lieutenant General David A. Deptula, USAF, "Toward Restructuring National Security," *Strategic Studies Quarterly*, Winter 2007, p. 11.

"supporting of *what*?"[37] *All* combatant elements, as appropriate in varying circumstances, "support" the pursuit of the joint force commander's desired effects in joint warfare.

In doing their part toward pursuing a more cooperative spirit in the joint arena, airmen should feel no compulsion to press for air-centric solutions for all circumstances. Like their fellow combatants in other components, they should instead recognise and accept that in some circumstances, air power can swing desired joint-force outcomes all by itself; in others, it will be supporting of other force elements; and in still others, it may be all but irrelevant to mission needs. At the same time, would-be detractors of air power's full range of potential offerings have an obligation, for their part, to understand that the interests of interdependent combat operations will *never* be served until air power is duly accepted as co-equal to all other force elements, neither more nor less pivotal in and of itself but a vital participant the joint effort, with the extent of its leverage and promise depending on mission needs of the moment.

Unfortunately, the achievement of such a desirable metamorphosis will forever remain at least easier said than done if not perennially elusive. Merely the power of a compelling idea by itself will never suffice to effect the needed transition. In each case, the implementation of a truly interdependent joint-force approach will ultimately require the dominating presence of a pragmatic joint force commander who will be not merely willing but determined as a matter of highest principle to assemble and oversee the execution of a plan of action that, in General Deptula's words, applies "the appropriate capabilities, at the right place, [and] at the right time to create the desired effect."[38]

37. James S. Corum, "Aerospace Power in Current and Future Small Wars," in James G. Fergusson, ed., *Aerospace Power: Beyond 100 Years of Theory and Practice* (Winnipeg, Manitoba: Centre for Defence and Security Studies, University of Manitoba, Silver Dart Canadian Aerospace Studies Vol I, March 2005), p. 79.

38. Deptula, n.36, p. 12.

INDIAN AIR FORCE: BUILDING INDIGENOUS RESEARCH CAPABILITY

T.M. ASTHANA

In December 1903, the first powered and "heavier than air" manned flight flew 20 feet above the ground, to a distance of 120 feet and for duration of 12 seconds. A little over a century since, air forces of the world have emerged as a technologically intensive arm of the nations' military forces. Such intense development in technology could not ever be predicted in the December of 1903. Each successive decade, and even each progressive year (at times) has witnessed aviation technology progress by leaps and bounds. We have witnessed how the revolution in military affairs (RMA) has introduced concepts like information warfare (IW), sophisticated smart bombs and precision guided munitions (PGMs), and a marked change from platform-centric warfare to network-centric warfare, thereby, reducing the observe, orient decide, act (OODA) loop to near real-time execution. The virtual adaptation of the "system of systems approach" to all aspects of warfare has led to greater synergy and interoperability.

Gradually, but surely, air power has been asserting itself as an increasingly potent factor in conventional warfare. The single most important variable

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Technological advances have traditionally yielded military advantages from the earliest times and in so doing, changed the relative balance between offensive and defensive capabilities.

that has altered the calculus of conventional capability mix and elevated air power to a dominant status is technology. Compared to land and maritime forces, air power is unique in its reliance on technology. Because an air force is a technology-intensive outfit, technological progress, or lack of it, will ultimately determine the potential and limits of air power. Technological advances have traditionally yielded military advantages from the earliest times and in so doing, changed the relative balance between offensive and defensive capabilities. In this, emerging and existing technologies presently favour air power at the cutting edge which has provided a fillip to air power to the extent that air power can today claim to be offensive by definition. This is because air power is now relatively invulnerable and exponentially more capable, thanks to stealth, electronic warfare and precision munitions technologies. A yet more significant force multiplier lies in IW capabilities with the exploitation of space-based and airborne sensors coupled with real-time data transmissions. Such capabilities of aerospace power will enhance not only "dominant battlespace awareness" and "operational synchronisation" but also the tempo of war as decision cycles have been shortened.

The generation gap in military technology between informationalisation, on the one hand, and mechanisation-cum-semi-mechanisation, on the other, is widening, and the military imbalance worldwide has increased. The role played by military power in safeguarding national security is assuming greater prominence. The vital aerospace capabilities are translating into on RMA by leading to a fundamental change in the nature of war primarily due to three significant developments:

- Information dominance in time and space contributing to real-time situational awareness and precision engagement.
- Breakdown of the classical division of the levels of war—strategic, operational and tactical—into a seamless operation.

- Transformation from linear to non-linear prosecution of war.

Any fundamental change requires to be nurtured to maturity delicately, deliberately, precisely and with clarity of thought as well as execution. The elements of aerospace power are virtually limitless, where each existing and new element has to be so conceived, designed and produced that it meshes into the architecture of the system to fine tune and/or enhance the overall capability and efficiency of the system.

It is considered imperative, therefore, to create an integral organisation in the Indian Air Force (IAF) which will contribute to research in two distinct fields. Firstly, to forecast future requirements in the design, capabilities and avionics in aircraft, munitions, equipment, infrastructure and communications, leading to network agility. Secondly, to provide a catalytic edge, by suggesting upgradations and modifications to the existing inventory. In other words, planning and executing basic research to ensure continued technological superiority; developing and transitioning new technologies for air force weapon systems and their supporting infrastructure; and ensuring responsive technical support for emerging problems whenever and wherever they occur.

AIM

The aim of this paper is to suggest a self-sufficient and effective integrated organisation of the IAF to support the IAF's strategic vision with a mission to discover, integrate and deliver affordable technologies for war-fighting by harnessing and steering a partnership of the IAF, industry, and academia.

TECHNOLOGICAL PUSH VS OPERATIONAL PULL

In the IAF, the Air Officer Maintenance (AOM) branch in Air Headquarters (HQ) looks after spares acquisition and provisioning as well as providing technical inputs on all matters inclusive of technical infrastructure and avionics, while the Air Officer Administration (AOA) branch caters for administration and infrastructure based on inputs from both the AOM and Deputy Chief of Air Staff (DCAS) branches. The DCAS branch, on the other

hand, is responsible for quantifying the Air Staff Requirements (ASRs) of all acquisitions, modifications, upgrades and equipment, after the Vice Chief of Air Staff (VCAS) branch places a demand. Invariably the ASRs drawn out rely heavily on published literature and the numerous glossies showered on the Air HQ (DCAS branch, in particular) by expectant vendors of national and international origin. There are operational experts also available for this purpose, but, generally, it is observed that this process is both too optimistic and far-fetched and may also fall well short, primarily because the gestation periods of research, testing and manufacture are not factored in totality. I recall the period in the mid to late 1970s when the ASRs were being drawn for the light combat aircraft (LCA). A series of presentations, discussions and demonstrations was held with operational and technical selected experts from the field and Air HQ staff. In a particular meeting, when a German group of experts for aircraft design-cum-manufacture was consulted, the response was, "*If you get all the performance figures, including the avionics and the armament capability you are asking for, you will have a ten-ton aircraft and not a LCA*."

Experience tells us that even where precise technical parameters and performance capabilities were quoted, the IAF had to remain content well short of the requirements because either indigenous capabilities fell short, or the internationally available equipment was not affordable economically. This is particularly true in relation to munitions. The reasons could be manifold but the end result was not satisfactory. It is also a fact that advanced, and more so, futuristic, technologies, that are or would be available internationally, came at prohibitive costs, with no possibility of achieving indigenous capability. **In other words, the IAF had to acquire what came its way by the available "technological push."**

The same situation prevails in all air forces where integrated operational research is absent. Though indeed desirable, the projected operational requirements of accretions, modifications and upgrades were pushed in the background and "technological push" has ruled the roost. It is the dream of all airmen that the accretions, modifications, upgrades, and munitions of the IAF's inventory be primarily responsive to "operational pull," be it for the

present or the future. **In other words, we would like to see the day/s when "operational pull" scores well over "technological push."**

We need to plan modifications and upgrades well in time to remain on top of prevalent technologies.

The author has mentioned accretions, modifications, upgrades and munitions virtually in the same breath. In case one desires to ensure excellence in all departments, all these stages need to be catered for. More importantly, all these stages need to be pursued vigorously with "operational pull" as the basic denominator. Let us look at the programmes planned for development of a new entrant in the international market, viz, the Eurofighter Typhoon. Barely a couple of years have passed since its induction in service and the Eurofighter is already working on the first batch of enhancements for the Typhoon Phase I Enhancement (PIE). The company also refers to this as the "First Batch of Enhancement for the Eurofighter." This modification will be available to customer nations from 2011, with the final release available in late 2012. This phase includes a new software architecture, enhanced multi-role man-machine interface (MMI), full LDP integration, enhancements of the multifunction information and distribution, global positioning system (GPS), defensive aids sub-system, including decoys, communications and network-centricity, as well as the integration of additional weaponry such as Paveway IV and EGBU-16. The Phase 2 Enhancement (P2E) is currently being negotiated with customer nations and is scheduled to be available from late 2014. P2E includes the integration of the MBDA Storm Shadow and Taurus standoff cruise missiles as well as the supersonic Paveway IV. Additionally, Phase 2 includes the addition of an enhanced communications suite and improved network-centric capability. Further enhancements planned for the Typhoon include the MBDA Meteor beyond visual range air-to-air missile integration, which is required to be operational by 2012. The Meteor flew on the Typhoon in the UK in 2005, in Italy in May 2007, and in Spain in October/November 2007. The Meteor has not flown in Germany as yet. Thus, we see that **the time has come for us now not to be satisfied only by accretions — we need to plan modifications and upgrades well in time to remain on top of prevalent technologies, which has been an**

With the introduction of commercially off the shelf (COTS) equipment and components in the aviation industry, several aspects of traditional military weapon system design are either modified or eliminated.

ongoing process for developed nations for a long time.

With the introduction of commercially off the shelf (COTS) equipment and components in the aviation industry, several aspects of traditional military weapon system design are either modified or eliminated. Key areas include physical and environmental characteristics of the various COTS hardware components. An open system implies that the system and integration of components should be analogous. Open systems provide cost savings by allowing a number of vendors to compete for the various hardware and software components in the broader commercial market. The architecture will no longer be tied to a specific vendor selling unique components built to proprietary or closed interface standards. By opening the architecture, future upgrades and new mission capabilities may be integrated with minimal integration and testing requirements. COTS hardware in the architecture is not specifically designed to operate in an airborne environment. In order to take full advantage of COTS, the design team needs to determine if certain components could be used. For example, the temperature range specified in the original airborne warning and control system (AWACS) specification required that all electronics operate within the operating range of -55°C to +85°C. After flying the E-3 more than 20 years, Air Combat Command determined that such a wide operating temperature range was not necessary in most cases. The requirement was modified to specify use in the +50°C range that is typical for most COTS electronics. This modification to environmental requirements provided the opportunity for use of an increasing number of hardware components from various vendors. COTS hardware used in the architecture includes single board computer cards, graphics accelerator cards, power supplies, network interface cards, network switches, fibre optics cables and solid-state memory devices. Coupled with the COTS components, some custom hardware and software

will also be required to interface the architecture to the remaining system. **This involvement of the Air Combat Command provides the proof of modifications suggested and accepted by "operational pull."**

It is inescapable that the IAF establishes an organisation and effectively exercises "operational pull" to equip its present and future inventories.

Achieving an IAF inventory that smarts with the state-of-the-art "operational pull" is easier said than done. The organisation so established must be able to accomplish five distinct spheres of research as its objectives**. Firstly**, it must be in a position to peep into the future in terms of appreciated emerging trends in all departments and prioritise them in time to remain well ahead of the contemporary standards. This applies to accretions, modifications, upgrades and integration with new munitions as well as avionics suites. **Secondly**, analytically assess indigenous capability as well as the will and economic capacity of indigenous participants who will execute the planned task after the basic inputs are provided by the IAF, i.e. they must be able to convert thoughts and plans into products in time, including additional research, if any. **Thirdly**, as and when required, work out the tradeoffs in terms of theoretical and optimistic capabilities versus practical ability of the participants and crew capability with the finished product. **Fourthly**, suggest procedures for harnessing and steering partnerships in the processes of development, trials, and production towards a win-win situation for all the participants. And, **fifthly**, in the absence of an all aspect indigenous capability, identify affordable COTS technologies of today, or even the near future. **Lastly**, it must be borne in mind that this list of objectives may be expanded in an incremental fashion as and when deemed fit and expedient.

It is, hence, considered inescapable that the IAF establishes an organisation and effectively exercises "operational pull" to equip its present and future inventories. It may be argued that with an organisation like the Defence Research and Development Organisation (DRDO) available, why can't this objective be achieved? It is submitted that the DRDO is basically a "technological push" agency comprising eminent individuals

and scientists. Every proposal made by DRDO is vetted at Air HQ, and if accepted in principle, ASRs are drawn out. Most of the ASRs are futuristic but in a majority of cases, the indigenous products have not met the ASRs. The net result is either acceptance of machine and equipment short of the ASRs or outright rejection. The former scores over the latter because it is argued that the capital investments involved for aircraft, equipment, items and munitions are excessive and will not be assuredly maintainable since the maintenance factors for uninterrupted supply cannot be relied upon if they are not indigenous. The comments in this paragraph are statement of facts and are not meant to cast aspersions on an elite organisation of our nation.

It is an undisputed fact that the indigenous route is the best and only route to follow in the long run. However, it must be ensured that the reequipping/ upgrades as also acquisitions must operationally cater for the near and distant future in most cases, and probably, for the present and contemporary standards in the case of some selected items. It is also true that no country is fully capable of providing indigenous articles for its air force since the number of sub-units involved in production are many and each one of them demands specialised research. Hence, you have an American aircraft with a British engine, Spanish undercarriage, etc. How does one put all these pieces together in the puzzle? **The answer to that lies in creating an organisation whose main contribution is to ensure that the IAF inventory is "operational pull" orientated and that the same organisation is held responsible to discover, integrate and deliver affordable operational technologies.**

THE TIME FACTOR

A major question that comes to mind at this stage is, "When should such an organisation commence functioning?" The answer is, "It should have commenced functioning nearly 10 years ago." This is primarily so since our gross domestic product (GDP) growth rate commenced an upward trend around this period and India has a sound economy now. There is an article that appeared on the net on August 15, 2008, as follows: "Britain's property agents are now targeting an estimated 1.25 lakh Indian dollar millionaires

who are expected to invest nearly $30 million (Rs 1.2 lakh crore) over the next decade in London apartments. Rich Indians could rescue or stabilise the market. Jones Lang La Salle reckons that by 2025, nearly 600 million Indians will have sufficient financial means to invest in 20,000 to 30,000 homes worth as much as $15 billion." While this article is not directly in the context of the subject matter, it is indicative of the effects a sound Indian economy has created internationally. Therefore, there is reason to believe that it is time now also for the Indian economy to also apply itself in the role of contributing towards building an enviable inventory for the military (and, in our case, the IAF) for the nation. Towards this effort, the essence will lie in building the indigenous production and ensuring that the present as well as predicted economy of India is capable of supporting this venture.

It is time now for the Indian economy to also apply itself in the role of contributing towards building an enviable inventory for the military.

There was a time when everything to do with production of material, goods and acquisitions for the military (including the IAF) that was indigenous was only by the public sector/government agencies. This did create employment but the technological growth of the nation was very slow indeed. Supporters of yesteryear's policy may lay the blame entirely on the adverse international regime of sanctions, export controls and technology denial, but that is only half the truth. Today, there is an overwhelming demand for the private sector to participate at every level to provide a catalyst to the overall military production, and that too, of standards that are comparable or better than the available contemporary standards. Now that the green signal has been given for the private sector to contribute towards this aspect also, the speeding up process should be well on the cards. Perhaps two recent articles may highlight this further. Firstly: "Gone are the days when manufacturing companies used paper and pen to draw mechanical and electrical designs. Most use computer-aided-designing (CAD) solutions, which reduces costs, brings in efficiency and increases productivity. The impact of CAD is often dramatic. Stumpp, Schuele and Somapa, a Bangalore-based company, manufacturing springs

and auto components, found CAD solutions a 40% reduction in development and testing cost. Ajay Advani, head of manufacturing solutions in India for Autodesk, one of the world's biggest CAD solutions companies, says some of the best-in-class manufacturers have reported that for their most complex products, they reached the market 99 days earlier, with $50,637 lower development costs with CAD solutions. From the CAD perspective, it is the 3D design technology that will give companies a major edge" (extracted from *The Times of India,* August 16, 2008). Secondly, is an extract from *Rediff Com* dated February 15, 2008, by George Iype: "Is India, and particularly, Bangalore, emerging as a global aerospace hub? In Feb 2008, Spirit Aero Systems, the world's largest independent supplier of structures for commercial aircraft, teamed up with Infosys Technologies to set up an engineering center at the Infosys campus in Bangalore. Spirit Aero Systems builds part of every Boeing commercial aircraft currently in production, except the Boeing 717. Its products include the 737 fuselages, nacelles and pylons, as well as nose sections, for the 747, 767, and 777 aircraft. Spirit also designs and produces slats, flaps, forward leading edges for 737 wings, slats and floor beams for the 777 airplane, and wing and fuselage components for the 747. The center, according to Infosys officials, will focus on high-end engineering services including product development, design and analysis of airframe structures, engineering change management and stress engineering support."

It is not Infosys alone that is taking up prestigious aerospace projects. Last year, the Indian Institute of Science (IISC), India's most prestigious science research institute, joined hands with Boeing, the leading manufacturer of satellites, commercial jetliners and military aircraft, to work on nine unique projects to build the next generation aircraft. Involved in this massive project are nearly 40 researchers at the IISC. It is for the first time that such an extraordinary project is being handled by an Indian institute. The project is managed by the Society for Innovation and Development (SID), which the IISC founded more than a decade back as its commercial arm. As per the IISC-Boeing understanding, the aerospace major would invest $5 million in research every year for the next few years in the company's aircraft projects with the institute. SID undertakes

research and development projects based on individual or joint proposals from the faculty and scientists of IISC in collaboration with industries, business establishments, and national and international organisations.

The time is now to establish the proposed organisation in the IAF for achieving operational excellence for the inventory of the IAF.

It is a certainty that the IISC-SID combine can also cater for the "operational push" of the IAF if the demand is projected in the format asked for. Further, it is not only the IISC-SID combine that can propel the aerospace industry in India. There are many potential contributors waiting in the wings who yearn to be provided with the authority to tread on the path of aerospace development. It naturally follows that if clearly delineated procedures were followed, it would be possible to delegate responsibility along with authority for achieving the prescribed goals. It is, therefore, opined that **the time is now to establish the proposed organisation in the IAF for achieving operational excellence for the inventory of the IAF, when the Indian economy as well as technology development has reached standards of excellence.** It must be appreciated that for such an organisation to stabilise, the time required could be anywhere between 6 to 8 years. This period would be required for such an organisation to not only stabilise, but also to reach a credible stature as the prime adviser, coordinator and integrating centre for the objective set out by this paper.

AIR FORCE RESEARCH LABORATORY (AFRL)

The above terminology and the organisation belong to the US Air Force (USAF). Prompt is the observation: Why must we ape the West? We need not, but there is no harm in analysing a well-honed organisation that has delivered the planned objectives and more. We must acknowledge, as indeed the world does, that the USAF **is** the best air force and that it has remained well ahead of all the air forces of the world. It is also a fact that the technologies adaptation of the USAF has been the envy of all. Therefore, a preview of the AFRL suits our proposal of establishing an organisation to precipitate operational pull. It must be noted at

this stage that we need to develop an organisation which will suit our resources (both economic and human) and our future vision of the IAF.

THE AFRL OF THE USAF

The AFRL in its present state was formed in 1997 from an organisational consolidation of four former Air Force Laboratories. AFRL's goal is to create a more efficient, effective organisation to support the air force's global engagement vision. The laboratory is responsible for the air force's annual $1.2 billion science and technology programme, including the full spectrum of air force basic research, exploratory development, and advanced development. The laboratory is the air force's manager for technology transfer to, and exchange with, civilian enterprises. Its also the manager for the Small Business Innovation Research; Dual Use Science and Technology; the Air Force Science Fair Programme, which encourages high school students to pursue a technical education; and for monitoring the aerospace industries' independent research and development programmes.

AFRL employs more than 6,300 military and civilian personnel (1,600 military and 4,700 civilian). The laboratory and its predecessors have overseen more than 80 years of critical research efforts for the air force and Department of Defence (DoD). Its technological breakthroughs can be found in all of today's modern aircraft, spacecraft, and weapon systems, including the F-117 stealth fighter, B-2 bomber, C-17 airlifter, and F-22 fighter. AFRL has contributed to significant advancements in modern communications, electronics, manufacturing, and medical research and products. The laboratory is organised along nine technology disciplines as under:

The laboratory is responsible for the air force's annual $1.2 billion science and technology programme, including the full spectrum of air force basic research, exploratory development, and advanced development.

1. *Air Vehicles Directorate*. The directorate is organised into four technology divisions (Structures, Aeronautical Sciences, Control Sciences and Integration & Operations), which

collectively cover or interface with all research and development areas associated with the conception, analysis, experiment, simulation, design, and test of aerospace flight vehicles over the entire flight spectrum.

2. *Human Effectiveness Directorate.* The directorate is organised into six technology divisions (War-fighter Training Research, Crew Systems Interface, Directed Energy Bioeffects, Integration and Operations, Biodynamics and Protection, and Development and Sustainment). This directorate is responsible for improving human interfaces with weapon systems to assure the preeminence of US air and space forces.
3. *Information Directorate.* This directorate develops systems, concepts and technologies to enhance the air force's capability to successfully meet the aerospace information technology needs for the 21st century.
4. *Materials and Manufacturing Directorate.* This directorate develops materials, processes, and advanced manufacturing technologies for use in aircraft, spacecraft, missiles, rockets and ground-based systems.
5. *Munitions Directorate.* The directorate's emphasis is on the weapon's capability to operate with complete autonomy and with high accuracy.
6. *Propulsion Directorate.* The directorate provides "one-stop shopping" for all forms of propulsion science and technology of interest to the air and space forces. The directorate is also responsible for most forms of power technology (other than those required for spacecraft), making it one of the nation's leaders in the field of energetics.
7. *Sensors Directorate.* This directorate conceives, demonstrates, and transitions advanced sensors and sensor technologies for air and space reconnaissance, surveillance, precision engagement, and electronic warfare.
8. *Space Vehicles Directorate.* This directorate is organised to develop space technologies that support the evolving war-fighting requirements.
9. *Directed Energy Directorate.* This directorate develops, integrates, and transitions science and technology for directed energy to include high power microwaves, lasers, adaptive optics, imaging and effects to assure the preeminence of the US in air and space.

It is proposed that the Aeronautical Development Agency (ADA) be handed over to the IAF by DRDO.

In addition, the Air Force Office of Scientific Research manages the entire air force's basic research programme, and its technical experts sponsor and direct basic research conducted in the nation's universities, industry and government agencies.

SUGGESTED ROUTE PLAN

The First Step

The IAF already has a technological sensitive unit called "Software Development Institute" (SDI) manned totally by IAF personnel. This unit took over from the IIO and was initially involved in developing follow-up marks of the DARIN system. Today, it is involved in design, development, testing and production of avionics components for the SU-30, Bison and an ATC simulator. There may be more tasks allotted (I am sure), which the author is not aware of. The seminal point is that the IAF already has a readymade platform to take off from. The SDI is a self-accounting unit and its members accompanied the IAF team for the Red Flag exercise to cater for on the spot changes in the software programmes for interoperability. This unit probably could commence as the hub of activities for the entire operational pull programme. Along with this move, it is proposed that an institution called the Aeronautical Development Agency (ADA) be handed over to the IAF by DRDO. There should no apprehensions in the minds of the present civilian staff in respect of their jobs, since this IAF organisation will also have civilian staff at all levels. It is observed that the expertise built up during the manufacture of the HF-24 aircraft just disappeared when the project was foreclosed. The ADA is presently involved in the design of the LCA. Such a developed expertise pool must be put to good use by the IAF and the nation. **It is hoped that**

The combination of IAF and civilian personnel will provide the sought after operational pull inputs for the IAF with a scientific backing.

the combination of IAF and civilian personnel will provide the sought after operational pull inputs for the IAF with a scientific backing.

The Second Step

Presuming that it is accepted that the time is right now, we need to be clear about how to proceed in a planned manner to achieve the operational pull. We have already established the facts that the indigenous route is the best available option, and that involving the private sector is an escapable necessity. The organisation created must, therefore, in the first place, ensure that the organisation builds the minimum credibility (to start with) to guide and propel the indigenous capabilities of both the public and private sector units towards perfection in the state-of-the-art in design and production of the components (big and small) to be used in aerospace power. It must be emphasised that these products or their variants will also, to a large extent, be capable of adoption in dual/triple use articles. Secondly, where possible, place such demands on multiple agencies to generate a competitive spirit that they will ultimately get used to in the future, like the USAF tasks companies like Boeing and Lockheed to do additional research for an aircraft and then chooses one out of the competitors' proven product for mass production. Thirdly, suggest the employment of selected ex-Service personnel in the private/public sector units who will assuredly contribute to the operational pull of the IAF. And, fourthly, suggest methods and procedures that ensure that the logistics footprint of the finished product is minimal. It is recommended that the first two steps be restricted and practical to ensure satisfactory achievement of objectives. **When such restricted objectives are achieved, then and then only, should action be taken to enlarge the scope of the organisation.**

The Third Step

"Tomorrow's war will be digitised and communications sensitive" is a statement we hear over and over again. Also, the qualities of precision weapons today permit an aircraft to fire and forget, and yet be assured that the cruise missile released will self navigate through streets in urban

Identify the public/ private sector agencies, the academia and educational institutions for research that should be given contracts for the specified research.

areas and hit targets through windows with NO collateral damage. The question that I pose is this: "Will anybody willingly give you this technology even if you purchase it"? The answer is NO. **A very structured plan must be evolved to acquire this technology. My suggestion is to follow the philosophy of "beg/borrow/steal".** I need not enumerate the various success stories where nations have achieved their objectives through this route.

The Fourth Step

Identify the public/private sector agencies, the academia and educational institutions for research that should be given contracts for the specified research. The research contracts could and should be given to more than one agency for the same subject, thus, creating the desired sense of competition in an advanced economy nation. In the ultimate analysis, such a move will ensure the highest standards of perfection and capability. In the event when no such research agency can be identified, **identify the COTS equipment that will ensure uninterrupted supply of the equipment and its spares.**

The Fifth Step

I have purposely not called it the last step since this will ALWAYS remain an incremental organisation. Here, I would like to suggest that a separate branch of officers and trade of airmen be created to man the organisation. It must also be ensured that there is a mix of civilian and uniformed personnel but the head of each organisation must be an officer in uniform who is professionally seasoned. This proposal will ensure continuity, which is so essential in the fields of analysis, research, design and production. Above all, the secret contents that every military arm needs to preserve and cherish should be well looked after when **the core knowledge is restricted to the minimum personnel.**

WHY AND HOW OF AIR DOMINANCE

A.V. VAIDYA

It is easier and more effective to destroy the enemy's aerial power by destroying his nests and eggs on the ground than to hunt his flying birds in the air. And every time we ignore this principle, we commit an error.

— General Guilio Douhet 1921

War is generally defined as a last step towards achievement of the country's political aims. The manner in which a war starts and the way it is conducted depends on many issues. Today, wars are fought not solely by the armed forces but also by all citizens united in a joint effort which touches every phase of national and private life. Wars could be peaceful in nature, popularly referred to as cold wars or they could involve a high level of violence, termed as shooting wars. They could be fought at strategic level or operational level or tactical level. They could be direct or indirect, termed as asymmetric wars. No matter what form a war takes, whether it is cold or hot, direct or indirect, no matter at what level it is fought, it has been noted that air power plays a very vital role in determining its outcome. No military action today, however limited or localised in nature, can be conducted without regard to the effects of

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Ideally, an air force should first ensure that the enemy is unable to launch his aerial weapons against own targets.

possible air operations. In fact, air power has played a very crucial and a very decisive role in almost all the wars fought post World War II.

World War II crystallised certain philosophies and doctrines regarding the usage of air power and certain very important conclusions were arrived at. Principles were evolved for planning and conducting joint operations among the army, navy and air force but the most important single conclusive lesson was that "no country can win a war in the face of hostile air power; no defence can sustain itself against an enemy who controls the air." This lesson of trying to establish a certain amount of air superiority before commencing any important operation on land or on sea has proved itself beyond doubt time and again in the various post-World War II conflicts.

Any air force has two primary functions to perform – one defensive and the other offensive. To perform these functions and to ensure the necessary impact of air power on the enemy, a well balanced air force has to resort to various types of air operations. These various air operations can be divided broadly into strategic and tactical and also offensive or defensive. Strategic operations by definition imply those which have a long-term effect and are directed against present and potential enemies, while tactical operations are those which have an almost immediate effect on the outcome of the war and are directed towards the enemy in a particular theatre of operations.

Ideally, an air force should first ensure that the enemy is unable to launch his aerial weapons against own targets. This could be achieved by destruction of enemy air assets at source through offensive action and if this has not been fully possible, then the air force should be able to deal with those weapons which have been launched by the enemy against own targets through properly executed defensive operations.

Right from the time the aircraft was used as a weapon platform, it has always been the endeavour to deny the enemy the use of his aircraft. All actions and all operations that are conducted to achieve this aim are clubbed

together under the heading of counter-air operations. This is a very simple and a very general definition of counter-air operations. It implies action against everything of the enemy that goes into ensuring that his aircraft take to the air effectively. It would include raids on his aircraft industry, the aircraft themselves, fuel dumps, ammo dumps, technical and servicing facilities, a raid even on the briefing room where pilots have gathered, etc. All such raids which effectively reduce the enemy's capacity to launch his air elements against own targets fall under the category of counter-air operations.

Air superiority is a state measurable in terms of degree of freedom that own forces can be said to enjoy against the enemy's air power.

Counter-air operations thus aim to ensure that the enemy is denied the use of his aircraft so that one can use one's aircraft freely as and when and where one desires and this, in other words, is called attaining air superiority. Air superiority is a state measurable in terms of degree of freedom that own forces can be said to enjoy against the enemy's air power. When this degree of freedom is 100 percent, one would call it air supremacy which would mean total absence of enemy air or total absence of enemy's interference from the third dimension. This kind of air supremacy was possible in the good old days when the size of the air forces was not too large and when the assets were kept in the open. The element of surprise, if executed effectively like, for instance, in the Arab-Israeli War, could guarantee a high degree of air superiority bordering almost on air supremacy. Even today, if two sides with great disparity are locked in a conflict, as was the case in the Gulf War, then such a state can be achieved, but it would be more as an exception. In today's context, it is widely accepted that air supremacy would not be possible, particularly in conflicts where parity or near parity exists. This is so because, after the Seventies, most air power assets have been given hardened protection and a very lethal air defence umbrella as a result of which even a discreet preemptive attack will not cause total destruction of enemy air assets.

Because air supremacy is not possible, military strategists all over the world have begun to accept a lower degree of air superiority which they

Air superiority, no matter how temporary, or how limited over the area on which attacks are to be carried out, is still of decisive importance.

refer to under various names like "limited air superiority", "air dominance", "command of the air", "favourable air situation", etc. All these terms by and large mean the same but vary only in degree. The definition of favourable air situation as applicable today is, "That degree of dominance in the air battle of one air force over another, which permits the conduct of operations by the former and its related land, sea and air forces, at a given time and place without prohibitive interference by opposing forces." It must be remembered that to win any war, an air force has to fight to satisfy the cardinal principle of achieving air superiority to whatever degree possible, and the higher the degree achieved, the faster will be the victory. Air superiority, no matter how temporary, or how limited over the area on which attacks are to be carried out, is still of decisive importance.

In this context, the statement made by Gen Giulio Douhet in 1921 is of great relevance. He said, "Air superiority means to be in a position to wield offensive power so great it defies human imagination. It means to be able to cut an enemy's army and navy off from their bases of operation and nullify their chances of winning the war. It means complete protection of one's own country, the efficient operation of one's army and navy and peace of mind to work and live in safety. In short, it means to be in a position to win. To be defeated in the air, on the other hand, is finally to be defeated and to be at the mercy of the enemy, compelled to accept whatever terms he sees fit to dictate. This is the meaning of Command of the Air."

Sir Winston Churchill also summed up the effects of air superiority very comprehensively. He said, "Once air superiority has been achieved and real mastery of the air obtained, all sorts of enterprises which normally look impossible, would become easy. All kinds of airplanes, which it is not possible to use on the fighting front would come into play. Considerable parties of soldiers could be conveyed by air to the neighbourhood of bridges or other important points, and having overwhelmed the local guard, could, from

the ground, effect a regular and permanent demolition. The destruction of particular important factories would also be achieved by carefully organised expeditions of this kind. All his camps, depots, etc could be made the object of constant organised machine gun attacks from low flying squadrons. But the indispensable preliminary to all this is to defeat the air forces of the enemy."

He further said, "The primary objective of our air forces is plainly apparent namely, the air bases of the enemy and the consequent destruction of his air fighting forces. All other objectives, however tempting, however necessary it may be to make provision for attacking some of them, must be regarded as subordinate to this primary purpose. Any effort, any action or any resources diverted from the aim of obtaining air superiority makes conquering the command of the air that much less probable and it makes defeat in case of war that much more probable."

Whenever the question of air superiority comes up for discussion, particularly so in inter-Service forums, there is always a commotion accusing the air force of fighting its own "private war". Despite the fundamentals of air power employment being so simple and so clear, it is surprising to note that so many army officers at all levels wonder as to, "Why do opposing air forces start banging each other as soon as the war starts? Why don't they use these aircraft to provide support to the army in the TBA (tactical battle area)?" They want to know how many sorties the air force will provide for their support on D-1, D-2, D-3, and so on so that they can make their fire plan accordingly. The basis of all such doubts is their lack of understanding of air operations.

As a result of limited understanding of employment of air power, many army officers all over the world often have a crib against the air force, that despite having so many aircraft, not enough close air support was provided to them in the wars gone by. Some will even swear that they did not see even a single

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aircraft that came over them to assist or enhance their fire power or raise the morale of the troops in their units/formations. With this observation, they quickly conclude that the air force did not do its job. To such officers, one needs to put the question, "Did you see an enemy aircraft over you pounding your unit?" If not, then rest assured that the air force had done a damn good job of ensuring that the enemy air was kept off your back. Many soldiers tend to measure the performance of their air force by the number of own aircraft seen by them in close air support rather than by the absence of enemy aircraft. For employment of air power, the priorities as laid down by most air forces are as follows:

(a) First priority – to gain the necessary degree of air superiority by carrying out counter-air operations.
(b) Second priority – to prevent the movement of hostile troops and supplies into the battle area or within it.
(c) Third priority – to participate in a combined effort of the air and ground forces in the battle to gain objectives on the immediate front of these ground forces.

The four principles in the use of air power set out during World War II by Marshal of the Royal Air Force Viscount Trenchard, and which are valid even today are:

(a) To obtain mastery of the air and to keep it, which means continuously fighting for it.
(b) To destroy the enemy's means of production and communications in his own country by using strategic bombing force.
(c) To maintain the battle without any interference by the enemy, which means to enable the commanders to build up the colossal supplies and reinforcements necessary for the battle and to be able to maintain them without interruption by the enemy.
(d) To prevent the enemy from being able to maintain the battle, that is, to prevent him from being able to build up adequate supplies for his army.

Yet another grey area which has been the cause of misleading many officers in thinking that counter-air operations are carried out mainly for the benefit of the air force concerns the way the various air operations have been divided in the past. The traditional way of dividing the offensive air operations has been into two categories, namely, counter-air operations (COA) and offensive air support (OAS) operations. Perhaps these divisions are quite outdated when seen in relation to today's battle philosophies. The very fact that the counter-air operations have been separately listed from OAS operations, tends to give an impression that counter-air operations are not being performed in support of the land or naval forces. Such a division suggests that counter-air operations are more a problem of the air force and in no way connected in giving support to the sister Services. This, of course, is far from the truth. The entire planning of counter-air operations is directly related to the overall land/sea operations to ensure that these operations can be carried out without undue interference from the enemy air force. In fact, it will not at all be wrong to say that, "counter-air is the best method of providing offensive air support," a fact which is not very easily understood by many officers of all the three Services.

The very fact that the counter-air operations have been separately listed from OAS operations, tends to give an impression that counter-air operations are not being performed in support of the land or naval forces.

To understand why own air force starts banging the enemy's air force at the start of war, let us examine the effect of "enemy air superiority" or "own air inferiority" on our army in the field. Enemy air superiority will imply that enemy air power will have adequate freedom to interfere with all our operations while, at the same time, own air power will be denied this opportunity. Thus, the effect of air inferiority will be two-fold. Firstly, enemy air will be able to hit our army at will and, secondly, our air force will not be able to help our army by hitting the enemy's army. Under circumstances of air inferiority, our soldiers, equipment, command and control systems, etc will be under attack, resulting in heavy losses of all forms in men and material,

Thinking logically, it will be clear that attainment of air superiority is perhaps more important to the army than the air force.

weakened morale, restricted mobility in the field, and so on. In contrast, our air force will be severely restricted in its ability to provide all means of tactical support to our troops whether by reconnaissance, logistics or offensive air support. Many of our aircraft would get shot down or severely damaged by the destructive element of the enemy's air power and may not reach their tactical targets. Some aircraft, on being engaged by enemy interceptors, may even have to jettison their war load to survive, thereby, rendering the mission abortive. The effect of loss of air inferiority on our armed forces can, thus, be summed up as follows:

(a) Greater air effort diverted for air defence of own vulnerable areas (VAs) and vulnerable points (VPs) to prevent enemy air interference. This would indirectly result in less strike potential being available for utilisation in support of own army.
(b) Greater number of enemy raids on own airfields resulting in hold-up/ cancellation of own sorties in direct support of the army.
(c) Increased harassment from enemy air in the TBA for own land forces.
(d) Increased own aircraft attrition over the TBA due to enemy interceptors and other air defence (AD) weapons.
(e) Decreased/curtailed freedom of manoeuvre for own land forces in and near the TBA and also in depth for deployment/redeployment of ground forces for offensive/counter-offensive.
(f) Increased number of abortive sorties in direct support of the ground forces due to attrition/jettisoning of war load.

Thus, thinking logically, it will be clear that attainment of air superiority is perhaps more important to the army than the air force. Army commanders, when asked to prioritise the requirements they expect the air force to meet, in the past have, and in the future will, almost unanimously, say that the most valuable contribution that the air force can make to the army in joint operations

is "to keep enemy air off their back". It is the air power in opposition that is most dreaded. "No air opposition and no air support" is a happier situation to be in rather than be subjected to hostile air power and, at the same time, have one's own air force in support in the TBA. Immunity from enemy air is the first and most basic requirement of the army and this can only be guaranteed by winning the air war first and creating a favourable air situation. A favourable air situation would ensure the following for the three Services:

(a) Own aircraft will be able to operate with greater freedom.
(b) Own army will have the required freedom to manoeuvre and concentrate for offensives or when deploying/redeploying against enemy initiatives.
(c) The navy, whether land-based or seaborne, will have the required freedom despite being within range of enemy air.

To amplify further why an air force starts attacking the enemy air force with a majority of its strike aircraft instead of devoting most of them for support of the army in the TBA, let us consider a simple example. In a conventional war between two more or less equally equipped countries without much asymmetry, four scenarios can develop as far as the air force is concerned:

Scenario 1: Blue's Air Force hammers Red's Army and Red's Air Force also hammers Blue's Army.

Scenario 2: Blue's Air Force hammers Red's Air Force in an attempt to prevent Red's Air Force from hammering Blue's Army, whereas Red's Air Force concentrates on hammering Blue's Army.

Scenario 3 (Reverse of Scenario 2): Blue's Air Force hammers Red's Army while Red's Air Force in an attempt to prevent Blue's Air Force from hammering its army, hammers Blue's Air Force.

Scenario 4: Both air forces hammer each other's air forces in an attempt to prevent the enemy's air force from interfering with own army operations.

In most war-games, when these four scenarios were presented to the top brass from the three Services and when they were asked which scenario they would prefer, a majority opted for Scenario 4. Almost all the top brass of

armies the world over are of the opinion that what they dread the most is the interference of the enemy air force during their own army operations. They would feel far happier not seeing enemy aircraft over them obstructing their progress rather than seeing own aircraft supporting them in the ground battle and enemy aircraft interfering with their plans. Many felt that the armies are generally quite well equipped to fight their own battle and that they can do very well without the support of own air force, provided the enemy's air force is kept out of the scene.

Therefore, it can be surmised that the first expectation of the army from the air force is, "Keep those damn enemy strike aircraft out of our sight." Secondly, what the army wants is support, as and when they find themselves in trouble and need help. In other words, the second expectation is, "Give me air support when I ask for it." Considering that these are the two basic expectations of the army in that order, it becomes quite clear that any air force should first engage the enemy air force and try and destroy it or at least try and ground most of his strike aircraft which are capable of interfering and causing damage to own army. The first aim of the air force should, therefore, be to reduce or if possible, totally destroy, the enemy's "strike potential." It would, however, be wrong to commit all the air power in counter-air operations. What ought to be done at the commencement of war is to utilise a majority of strike aircraft for counter-air operations and keep certain portion for providing close air support interdiction and air defence of the TBA should that become necessary.

The following example will highlight the mathematics involved in the utilisation of strike aircraft in counter-air and close air support. It will show how the availability of aircraft for providing close air support rapidly diminishes for the enemy due to own successful counter-air missions. It will also show how the availability of strike aircraft for providing close air support to own army increases consequent to successful and sustained counter-air strikes.

For ease of understanding and percentage calculations, let us consider that both the air forces – Blue and Red—have 100 strike aircraft each. Only strike

aircraft have been considered because mainly they have the damage causing capability. Blue Air Force decides to use 80 aircraft for counter-air operations and keep 20 for close air support, if required. As against this, Red Air Force decides to use all 100 aircraft in the TBA to support the army. Consider that Red Air Force gets the opportunity to take the initiative and carry out preemptive raids. The mathematics of strike aircraft availability for carrying out missions as the war progresses would be as given below. Let us team Blue Air Force as "A" and Red Air Force as "B".

	Aircraft over TBA		**Aircraft for CAO**		**Total Aircraft Available**	
Day – 1	**"A's" Aircraft**	**"B's" Aircraft**	**"A's" Aircraft**	**"B's" Aircraft**	**"A's" Aircraft**	**"B's" Aircraft**
Raid – 1	20	100	80	-	100	100
Raid – 2	19	60	77	-	96	60
Raid – 3	18	40	74	-	92	40

In Raid 1, Red Air Force carries out the initial strike using all 100 aircraft to hit Blue's Army. Blue Air Force immediately retaliates by using 80 aircraft to hit Red's airfields and other related infrastructure with the aim of grounding Red's aircraft. Attrition rate is presumed to be around 3 percent in CAO missions which is the generally accepted figure. This is expected to drop to 2 percent as the enemy air defence capability is progressively degraded. Blue Air Force, thus, loses 3 aircraft in Raid 1, another 3 in Raid 2 and another 3 in Raid 3—a total of 9 aircraft aircraft CAO missions. Three aircraft are also considered shot down in TBA. Thus, availability of Blue's aircraft drops from 100 to 88 at the end of Raid 3. However, Blue Air Force has all its airfields available for launching all 88 aircraft for night missions. Red Air Force loses one aircraft in TBA but as a result of heavy raids by Blue Air Force on their airfields, a fair number of the airfields become unusable and as such, the number of aircraft which can take off in Raid 2 is only 60 and due to more CAO missions by Blue Air Force, availability of aircraft for Red further reduces to 40 in Raid 3.

Day - 2						
Raid 1	20	60	68	-	88	60
Raid 2	19	30	65	-	84	30
Raid 3	18	10	63	-	81	10

Day 2 starts with 88 aircraft available to Blue Air Force and after overnight repairs to some airfields, 60 aircraft available to Red Air Force. Blue persists with CAO missions with 68 aircraft, keeping 20 for TBA missions and keeps hitting Red's serviceable airfields though it incurs loss of 4 aircraft in Raid 1, 3 aircraft in Raid 2, and 2 aircraft in Raid 3, ending up with availability of 79 aircraft for night missions. Red Air Force persists with missions in TBA in support of their army but due to some airfields becoming unusable and some aircraft getting shot down in the TBA, their availability of aircraft reduces from 60 to 30 for Raid 2 and further down to only 10 at the end of Raid 3 for night missions.

Day - 3						
Raid – 1	20	30	59	-	79	30
Raid – 2	19	10	57	-	76	10
Raid – 3	19	10	55	-	74	10

Day 3 starts with 79 aircraft available to Blue Air Force and after overnight repairs to some airfields, 30 aircraft available to Red Air Force despite night counter air missions by Blue Air Force on their airfields to disrupt their repair work. Blue persists with CAO missions with 59 aircraft keeping 20 for TBA missions and keeps hitting Red's airfields and incurs loss of 3 aircraft in Raid 1, 2 aircraft in Raid 2 and 2 more aircraft in Raid 3, ending up with availability of 72 aircraft for night missions. Red Air Force persists with missions in TBA in support of their army but due to more airfields becoming unusable, their availability of aircraft reduces from 30 to 10 for Raid 2 and Raid 3. By now, most of the Red Air Force's airfields are crippled, some beyond repair. Thus, for Blue Air Force, the requirement to carry out heavy counter-air missions

reduces and Blue Air Force can now devote more aircraft for support of the army. Thus, around Day 3 and beyond, the situation is reversed. Blue Air Force can now spare more aircraft for support of their army.

Day - 4						
Raid – 1	30	20	42	-	72	20
Raid – 2	40	10	31	-	70	10
Raid – 3	50	10	19	-	68	10

Day 4 starts with 72 aircraft available to Blue Air Force. Blue Air Force persists with night counter-airfield missions to disrupt the repair work. Red Air Force, however, manages to retrieve some airfields and starts the day with availability of 20 aircraft. Despite having lost 25 percent of its aircraft, Blue persists with CAO missions with 42 aircraft, increasing the aircraft for TBA missions from 20 to 30 in Raid 1 and then to 40 in Raid 2 and further to 50 in Raid 3. During the CAO and TBA missions, Blue loses 2 aircraft in Raid 1, 2 in Raid 2 and 1 aircraft in Raid 3, thus, ending up with 67 aircraft for night counter-air missions. Red Air Force has no choice but to persist with TBA missions in support of their army since they have just 20 aircraft available, further reducing to 10 for Raid 2 and Raid 3. Thus, around Day 4 and beyond, the situation is reversed. Blue Air Force can now spare more aircraft for support of their army. Red Air Force is practically grounded.

The above example, adequately tested in computer war-gaming, demonstrates how the availability of aircraft to the enemy reduces by starting with heavy counter-air operations on his airfields and related infrastructure like technical facilities, fuel and weapon dumps, etc. Today, the serviceability of high-tech modern aircraft is greatly dependent on the availability of technical infrastructure; hence, an attack on his technical labs can cripple these modern fleets. The example also demonstrates how despite losing nearly 30 percent of one's aircraft, the situation gets reversed around the third day of the war and how much greater support can be provided to one's own army by carrying out sustained counter-air operations.

Planning of counter-air missions is a complicated task. It involves a great amount of study and attention to major as well as minor details.

Over the years, certain fundamentals of air power employment have been arrived at. The first fundamental principle which has been amply discussed so far is to attack and reduce the enemy's "strike potential". Only the strike aircraft of the enemy have the capability to cause damage to our VAs and VPs and interfere with own army operations. Therefore, the first aim should always be to reduce the enemy's strike potential to the extent possible. His air defence aircraft can do no harm to one's army and, hence, one need not worry too much about destroying them. However, these air defence aircraft can cause damage to our strike aircraft when they cross the border to attack his airfields and related infrastructure. Hence, they will have to be countered by sending adequate air defence escorts along with the strike packages to take on the enemy interceptors and ensure that own strike packages remain safe.

There are two ways of destroying the enemy's strike potential. First, destroy his aircraft on the ground but since this is extremely difficult due to hardened shelters, aim to deny them take-offs by attacking his runways, but since runway denial is also getting increasingly difficult, target his airfield complex as a system with cluster bombs, napalm, bombs with delayed fuses, precision guided munitions (PGMs), etc so that the entire airfield is put out of action and his aircraft cannot take off. Secondly, use own air defence aircraft effectively controlled by the airborne warning and control system (AWACS) to shoot down his strike aircraft when they cross the border or preferably even before they cross the border and come for strike in own territory.

Many officers may not be aware how meticulously the counter-air missions are planned. In fact, these are the toughest missions out of all various missions that any air force is required to carry out because the attrition rate in these missions is comparatively very high and the fear of getting shot down in the enemy's territory and ending up as RIP (rest in peace) or POW (prisoner of war) is really terrifying. And yet the brave air force pilots undertake these missions just so that the army does not face the enemy air force's opposition.

Planning of counter-air missions is a complicated task. It involves a great amount of study and attention to major as well as minor details. Execution of this entire plan demands a lot of precision, high level of skill, split second decision-making, tremendous amount of situational awareness, flexibility and, above all, lot of guts. Planning starts taking into consideration the enemy's many factors like aircraft deployment, his radar ORBAT (order of battle), his air defence assets, intelligence acquired during peace-time, his air defence tactics pruned out of monitoring of his peace-time air defence exercises, capability of AWACS aircraft, the kind of air defence air-to-air and surface-to-air missiles that he has, his vulnerability to electronic warfare, etc. Based on all the available information, a thorough appreciation is carried out and the list of the enemy's air bases, radars, communication centres and other valuable targets which assist in launching of his strike aircraft is worked out. This list is prioritised and based on availability of own strike aircraft, air defence escorts, electronic warfare aircraft, a strike plan is worked out. The *modus operandi* generally is to disrupt his communication and data networking centres using PGMs, hard and soft kill of his important radars using anti-radiation missiles with the aim of adequately degrading his fighting capability so that probability of damage to own strike aircraft which closely follow these initial strikes is considerably reduced. Yet another tactic which is commonly used is to saturate his air defence weapons by executing simultaneous attacks on all these targets with a large number of aircraft. Such saturation raids need very meticulous planning and split second execution.

The entire raid is generally preceded by air defence aircraft crossing the border first assisted by AWACS aircraft to kill his interceptor force. These missions are called offensive sweeps. Their aim is to engage the enemy interceptors with the intention of shooting them down or diverting them away from own strike packages. This intrusion is closely followed by strike aircraft to attack his command and control centres and related infrastructure with PGMs to degrade his networking and to break his radar chain with anti-radiation missiles and also precision weapons. The aim of these coordinated strikes is to create a safe corridor for entry of the following strike packages and to degrade

The primary aim of any air force should be to try and establish a favourable air situation if not total air superiority so that own army and navy can carry out their operations unhindered by enemy air interference.

his overall ability to cause damage to our strike aircraft which cross the border shortly thereafter to attack his airfield complexes. These attacks on his airfields need very careful planning. Based on the targets to be attacked, a study is carried out to determine what weapons to use, what probability of success or, in other words, what assurance levels of destruction are required to be achieved in various attacks, what attrition rate to expect for own strike aircraft, etc. This exercise is called force structure planning. A complete attacking force of this nature in a particular raid, including strike aircraft with different weapons for various targets, air defence aircraft, air defence escorts, electronic warfare escorts to soft kill his surface-to-air-missiles, AWACS aircraft, airborne refuellers, unmanned aerial vehicles (UAVs) for real-time intelligence and other paraphernalia may amount to hundreds of actors which need to be meticulously stage managed. Those who have closely followed the way the United States Air Force (USAF) carried out their strikes over Iraq during the initial stages of the Gulf War to attain near total air superiority will be able to appreciate the tremendous amount of complexities involved in planning and executing strikes with such a large force.

In summary, it can be stated that at the commencement of any war, the primary aim of any air force should be to try and establish a favourable air situation if not total air superiority so that own army and navy can carry out their operations unhindered by enemy air interference. This is possible only with concentrated attacks aimed at destroying or grounding his strike aircraft, thus, effectively reducing his strike potential. The top brass of armies all over the world are of the opinion that they can do very well without the support of own air force as long as the enemy air force is kept out of sight and this can be made possible only by carrying out sustained counter-air operations.

PAKISTAN NAVY: NEW CAPABILITIES, NEW ROLES?

SHALINI CHAWLA

Since its establishment, the Pakistan Navy has struggled for funds, attention from the defence planners and more modern naval platforms. Naval acquisitions in Pakistan faced challenges due to the small share that the navy received from the defence budget and the sanctions which Pakistan suffered in its relationship with the United States. Its developments suffered not only due to the resource constraint but also due to lack of understanding from the army leadership that also ran the country for most of the life of the country. Ironically, the navy did not receive an adequate share despite the fact that it was the only means of safeguarding Pakistan's eastern flank some 2,600 nautical miles away.

BIRTH OF THE PAKISTAN NAVY

On the eve of independence, August 14, 1947, the state of the ships allocated to the Royal Pakistan Navy by the Partition Council was as shown (Table 1).

At the time of independence, the force levels of the Royal Indian Navy were divided on a rough basis of 1:2 for Pakistan and India owing to India's greater oceanic and coastal requirement. The Royal Pakistan Navy (RPN) secured two sloops, three frigates, four fleet minesweepers, two naval trawlers four harbour launches and some 358 personnel (180 officers and 34 ratings), and

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given the high percentage of delta areas on the Pakistan coast, the navy was given a number of harbour defence motor launches. The main challenges faced by the Pakistan Navy after partition derived from the following four factors:[1]

1. Difficulties in communication and defence posed a serious problem due to separation between the western and eastern wings of Pakistan.
2. The army occupied a dominant position in the country's power dynamics and the perceived threat from India was focussed on the territorial security.
3. Lack of maritime facilities and bases. Karachi was the main port with extensive infrastructure and facilities.
4. Initial growth of the navy was retarded by a serious shortage of trained personnel. Out of nearly two hundred officers, only nine had a regular commission and three of them were in the executive branch. The senior most Pakistani officer was an acting captain.[2]

Table 1

(a) In Karachi

Anti-Aircraft Frigate	HMPS Godawari Flagship
Fleet Minesweeper	HMPS Oudh
Fleet Minesweeper	HMPS Baluchistan
Minesweeping	HMPS Baroda
HMPS Baroda	Harbour Defence Motor
Launches	1261 1262 1263 1266

(b) In Bombay (awaiting handing-over or undergoing refit):

Anti-Aircraft Frigate	HMPS Narbada
Anti-Submarine Frigate	HMPS Shamsher
Fleet Minesweeper	HMPS Malwa

1. Vice Admiral R.B. Suri, "Pakistan Navy Force Level Options," *Agni*, vol. VI, no. 1, January-April 2002, pp. 42-62.
2. Suri, Ibid.

Fleet Minesweeper	HMPS Kathiawar
Minesweeping Trawler	HMPS Rampur
Motor Minesweeper	MMS 129
Motor Minesweeper	MMS 131

In addition, an anti-submarine frigate, HMPS Dhanush, was at sea, on a cruise off the East African coast.

Source: *Story of the Pakistan Navy 1947-72*, History Section Naval Headquarters Islamabad (Karachi: Elite Publishers, 1991), p. 62.

UNITED STATES ALLIANCE AND THE NAVAL PROCUREMENTS: 1954-1965

Pakistan joined the Western alliance and entered into the Mutual Defence Agreement with the United States in the 1950s[3] and was able to a negotiate a handsome aid package from the US which has been considered a source of high technology defence equipment. The US alliance exposed the Pakistan Navy not only to the high technology equipment but also to the US doctrines. Exercises with the Western navies inducted professionalism into the Pakistan Navy and, thus, boosted its development in the initial stages.[4] In the words of Admiral Chaudri:

> ... the first real opportunity to expand the Navy came after the formation of the two regional security alliances, the Central Treaty Organisation (CENTO) and the South-East Asia Treaty Organisation (SEATO) as part of the grand US/Western strategy to contain communism……..It was mainly as a result of Pakistan's integration into the regional security arrangements that the RPN managed to acquire five destroyers, including the two modern Battle class destroyers from the RN Reserve Fleet. The ships were refitted and modernized in the UK with US MAAG's support.[5]

3. The US-Pakistan Mutual Defence Agreement was signed on May 19, 1954. This was followed by Pakistan's joining the Southeast Asia Treaty Organisation (SEATO) on September 8, 1954.
4. Ibid
5. *Story of the Pakistan Navy 1947-72*, History Section Naval Headquarters, Islamabad (Karachi: Elite Publishers, 1991), p. 184.

Whereas the civilian government was happy at the expansion of the Navy, the Army C-in-C at the time was not, as he was not convinced about the need for a strong Navy for Pakistan.

Pakistan's defence division had much less interest in building up the navy and the naval demands were not pursued with the same vigour as those of the army and probably of the Pakistan Air Force (PAF). Gen Ayub Khan was convinced that build-up of the navy was not the priority and, thus, the "highest priority had to be accorded to meeting a potential land threat from the Indian side……..only way by which Pakistan could prevent India from starting a war was by developing a strong Air Force…..A war between India and Pakistan was going to be fought on land and ultimate outcome of such a war should depend upon winning a land battle."[6] Admiral Chaudri confirmed the army's resistance for the naval expansion in his writings. He clearly stated, "It may be mentioned that whereas the civilian government was happy at the expansion of the Navy, the Army C-in-C at the time was not, as he was not convinced about the need for a strong Navy for Pakistan. He felt that we should have a coastal Navy along with some submarines."[7]

Despite falling low in the priority, the Pakistan Navy managed to receive one cruiser, five destroyers forming the 25th Destroyer Squadron and 8 minesweepers forming the 33rd Minesweeping Squadron. In addition to this, the US Military Aid and Assistance Group (US MAAG) provided assistance for the expansion of Pakistan's shore facilities, e.g. building of the naval ammunition depot in Mauripur and the naval stores depot in the dockyard.[8] According the Admiral Chaudri. "The induction of the MAAG assistance proved a takeoff point for the Pakistan Navy."[9]

In 1961, Pakistan received a salvage tug and a further floating dock, and in 1963, a tanker commissioned as PNS *Dacca* was transferred from the United

6. Ibid., p. 189.
7. Ibid., p.185.
8. Ibid., p.184.
9. Ibid.

States. Though the Pakistan Navy emphasised on building its submarine arm, it met with little success. Admiral Chaudri, in fact, recorded that the need for inducting submarines in the RPN was realised soon after 1947, but, as he stated, "No one was prepared to give us the submarines or the training in the early years."[10] With Pakistan's unsuccessful attempts to acquire submarines from the US and England, Pakistan turned to Sweden which was again a disappointment. Apparently, Admiral Chaudri's resignation was a result of lack of support from the government for the expansion of the Pakistan Navy. In the mid-1960s, the Pakistan Navy was assisted by the United States and Britain for the anti-submarine role which the Americans thought was important to meet any potential threat posed by the Soviet Navy.[11] Western assistance was instrumental in helping the Pakistan Navy to consolidate itself and it was able to lease its first submarine PNS *Ghazi* (from the US Navy) which was commissioned on June 1, 1964.[12] During the India-Pakistan War in 1965, for the first time, the Pakistan Navy was involved in a conflict. Apart from carrying out a limited bombardment of the coastal town of Dwarka, condenamed Operation Dwarka, the navy's submarime PNS *Ghazi* was deployed against the Indian Navy's western fleet at Bombay. India at that time had no submarine and little anti-submarine capability.

NAVAL ACQUISITIONS POST-1965

The India-Pakistan Wars in 1965 and 1971 halted the US military assistance to Pakistan and the modernisation programme suffered a major blow. Navies of both India and Pakistan were actively involved for the first time in the 1971 War. The Pakistan Navy was humiliated with the missile attacks during the 1971 on Karachi, and it lost its sole submarine PNS *Ghazi* in the war off Vishakhapatnam. Loss of East Pakistan proved extremely

10. Ibid., p. 185.

11. Suri, n.1, p. 43.

12. In 1962, the UK agreed to train 4X PN submarine crew and soon after, the US agreed to provide a fleet class submarine to the Pakistan Navy. The PNS *Ghazi* remained the flagship submarine for the Pakistan Navy until it sank in 1971, off the fairway buoy of Vishakhapatnam near the eastern coast of India during the 1971 War.

The Pakistan Army controls the military spending in Pakistan and, thus, the navy had low level of funding which was insufficient even to maintain its force levels.

demoralising for all the three Services in Pakistan. The navy was now concious of the new realities that its maritime interests would be oriented to the Arabian Sea and Persian Gulf.[13] The only advantage after the 1971 War was that the Pakistan Navy did not have the responsibility of guarding the coastline of East Pakistan and could fully concentrate on the western seaboard with a coastline of a mere 700 km. The navy, in a way assumed the role of guardian of the Gulf, to establish economic and political relations with the oil-rich Gulf countries.[14]

In the wake of American sanctions, Pakistan explored the alternate options for its weapon acquisition, and France, China and also the USSR became major sources. The aftermath of the 1971 War and separation of East Pakistan required that the Pakistan Navy should have adequate ocean-going capability, provided through large surface combatants.[15] The Pakistan Army controls the military spending in Pakistan and, thus, the navy had low level of funding which was insufficient even to maintain its force levels, thus, Pakistan's maritime strategy started veering towards the acquisition of underwater capability which enabled the navy to achieve sea denial with limited resources.[16] Thus, the importance of underwater forces gained momentum after 1965, and by 1966, the Daphne class submarines were under construction and plans were approved for raising a Special Services Group (SSG) similar to the US Special Forces Command.[17] Pakistani crew arrived in France in 1969 for manning the Daphne class submarines and realised that they had to unlearn a number of

13. Vice Admiral S.P.Govil, "Pakistan Navy – Then and Now," *Indian Defence Review*, vol. 10, no. 1, January-March 1995, pp. 49-52.
14. Govil, Ibid.
15. Suri, n.1, p. 44.
16. Suri, Ibid.
17. Commander Vijay Sakhuja, "Pakistan's Navy: A Brief History," *Defence and Technology* , June 2003, pp.12-14.

habits ingrained in the American submarines.[18] Lack of naval air capability remained a matter of deep concern for the navy.

The naval share of the budget was diverted substantively towards acquisition of submarines/underwater clandestine aircraft; consequently, the surface fleet remained neglected and disparity vis-a-vis the Indian Navy in the surface component increased.[19] However, by 1975, there was some relaxation in the US embargo and some military hardware was obtained by the navy but only on the cash and carry basis from the US. Pakistan received "Gearing" class destroyers on lease from the US between 1977 and 1983 .

After the 1971 War, the navy opted for a modest acquisition programme in the form of new Chinese built missile/torpedo attack craft. Between 1972 and 1980, 12 Slaughter class attack FPBs, 4 Hunaim class attack craft and 4 Huchwan class hydrofoil craft were delivered to Pakistan.[20] In the 1970s, the naval aviation wing of the navy started to gather momentum and subsequently progressed to become a potent force. There was realisation that absence of air surveillance in the Pakistan Navy had allowed the Indian Navy ships to attack Karachi harbour. On September 28, 1974, the rotary wing aircraft was introduced into the Service when the first of the six Westland Sea King helicopters was acquired from the United Kingdom.[21] Naval acquisitions in the late 1970s focussed on building surveillance and targeting capability and, thus, the deal for French Atlantiques was finalised. The acquisition formalities were completed in 1974 and finally the squadron was raised in 1976, with three Atlantiques.[22] In 1977, the Pakistan Navy acquired four SA 319B Alouette helicopters which were aimed at fulfilling the demands of

18. See Pak Navy Daphne Class Submarines, "The Decommissioning of the Daphne Class Submarines" by Rear Admiral Main Zahir Shah (Retd), at http://www.pakistanidefenceforum.com/lofiversion/index.php/t51970.html.

19. Suri, n.1, p.44.

20. "Pakistan Navy" at http://www.globalsecurity.org/military/world/pakistan/navy-intro.htm

21. 111 squadron was established for these rotary wing aircraft. PNS *Mehran* was subsequently commissioned as the base for the Naval Air Arm on September 26, 1975. The rest of these helicopters also arrived in the subsequent year. As cited in, http://www.globalsecurity.org/military/world/pakistan/navy-intro.htm

22. "PN Fleet and Establishments" at http://www.paknavy.gov.pk/aircraft.htm

the maritime missions due to the adequate navigation and communications equipment fitted onboard. Since its inception, the Alouette squadron has been supposedly meeting the naval requirements with 4-5 helicopters and presently Alouette strength consists of 5 aircraft.[23]

While the naval air was being looked into carefully, the submarine arm of the Pakistan Navy expanded with the induction of the fourth Daphne class in 1975, and in 1977, France cancelled supply of two Agosta class submarines to South Africa under the US embargo, which apparently were acquired by Pakistan in 1978.[24]

GROWTH OF THE NAVY IN THE 1980

The Soviet invasion of Afghanistan and Pakistan's status as a frontline state for Washington altered the dynamics of Pakistan's military modernisation plan, providing it a robust pace. The military regime in Pakistan under Gen Zia-ul-Haq fully utilised the US alliance to acquire high technology weapons. The 1980s was a rosy decade for Pakistan's military modernisation. Not only did Pakistan receive enormous military aid from the United States but also its economy grew at an astonishing rate, with gross domestic product (GDP) growth at 6 per cent giving it enough resources to fund the Western high technology equipment.

The Soviet invasion of Afghanistan and Pakistan's status as a frontline state for Washington altered the dynamics of Pakistan's military modernisation plan, providing it a robust pace.

By the 1980s, the Pakistan Navy had focussed on building aviation capability and bought the French submarine. Although, the gap between Pakistan's and India's naval capabilities had increased, build-up of the navy did not get priority in the Pakistani military mindset and also the Reagan Administration had little to offer to the Pakistan Navy in the initial period of the 1980s. The American military aid to Pakistan

23. Ibid.

24. Suri, n.1, p45.

in the 1980s had a two-fold objective: firstly, to strengthen Pakistan to an extent which would allow it counter Soviet expansion and, thus, play its role in the fight against Communism; and, secondly, to convince the military in Pakistan to take the strategic steps desired and instructed by Washington. The military in Pakistan, on the other side, was keen to maintain its strategic depth in Afghanistan and to build up its military capability to match India's conventional military superiority which constantly remained a source of Pakistan's perceived threat perception.

In the 1980s, the Pakistan Navy virtually doubled its surface fleet from nine principlal surface combatants in 1980 to 16 by 1989. It acquired the sophisticated long range anti-ship missile, the Harpoon, and enhanced its maritime reconnaissance capabilities.[25] Three sets of Harpoon missiles and launchers were procured for $156 million from the United States.[26] With the induction of these modern missiles, the Pakistan Navy acquired the offensive capability against the Indian Navy to some extent and developed the concept of "defensive zone" for Karachi, as stated by Vice Admiral Suri. Rings of defence parameters were patrolled by small missile craft, and "larger escort vessels were to guard Karachi. Securing of Karachi became number one priority and, thus, maritime surveillance and strike capability from the shore was deployed to strengthen the naval shield."[27]

There was increasing demand for the naval build-up and the print media in Pakistan was apparently active in representing the frustrations of the Service group and people in this regard. In the second half of the 1980s, Pakistan managed to receive significant US equipment, and eight frigates were offered on lease to Pakistan. The transfer comprised four Brooke class and four Garcia class frigates. Reports suggest that that these ships were part of an American plan to decommission approximately 600 ships from its navy.[28] The deal was

25. n.16.

26. Aysesha Siddiqua-Agha, *Pakistan's Army Procurement and Military Build-up, 1979-99: In Search of Policy* (New York: Patgrave, 2001), p.154.

27. Suri, n.1, p45.

28. Siddiqua-Agha, n. 26, p. 155.

Pakistan was able to acquire the high technology equipment at a much lower price owing to the favourable strategic environment.

financially favourable to Pakistan as the eight frigates cost Islamabad US $9 million, with an additional $186 for the acquisition of armaments and other support equipment. This included three SH-2F Seasprite anti-submarine helicopters, 64 Standard MR-SMI anti-aircraft, and 64 Honeywell MK 46 MOD 5 light weight anti-submarine torpedoes.[29] The US also provided Pakistan a depot for repairs and the ex-USS *Hector* was leased to Pakistan from 1989-94 which was renamed PNS *Moawin* and was used as tender for Brooke/Garcia class ships.[30]

In 1988, two ageing Leander class frigates and a County class frigate were inducted from the UK, and in 1982, Fokker F-27s were acquired. These ships were obtained at throwaway prices—Pakistan paid $20 million for the two Leander class and $3 million for the County class. Lack of funds consistently remained a deterrent with the Pakistan Navy (PN) and major equipment procured during the 1980s was second-hand equipment from the US; thus, Pakistan was able to acquire the high technology equipment at a much lower price owing to the favourable strategic environment. The United States, in the latter half of the 1980s, was interested in modernisation of the Pakistan Navy in order to utilise its capabilities for the security of the Persian Gulf.

The Pakistan Navy not only acquired the new equipment but also modified the existing fleet and in 1989, PN Atlantiques were modified to fire Exocet missiles. With this modification, PN Atlantiques became the first long-range maritime patrol (LRMP) aircraft to acquire anti-submarine warfare (ASW) capability. To maintain a qualitative edge in the field of LRMP operations, PN Atlantiques were modified with state-of-the-art French sensors like electronic support measures (ESM), acoustic processor, radar, navigation system, etc, in the mid-Nineties.[31]

29. Siddiqua-Agha, Ibid., p.155.
30. "Pakistan Navy Ship MOAWIN (ex-USS Hector)" at, http://www.usshector.com/ exHector.html
31. http://www.paknavy.gov.pk/aircraft.htm

In the 1980s, the Pakistan Navy was more assertive in nature and started demands for strike capabilities and additional surveillance.

In 1988, Pakistan signed a deal with the United States for the acquisition of three P-3C II.5 version aircraft. The first aircraft was scheduled to be transferred to Pakistan in April 1991, with the other two following in July and October 1991. The aircraft was desired as it had reconnaissance and ASW capability, which would have added to Pakistan's surveillance capability and, thus, provided Pakistan a capable replacement for its old ASW capable French Atlantique-I aircraft.[32] Till the late 1980s, there was little indication of change in the US policy towards Pakistan, and Pakistan was quite sure of getting the P-3Cs when the US arms embargo in the 1990 halted the deal.

Although cooperation between the Pakistan Navy and Chinese Navy dates back 1970, there was not much acquisition from China till to the late 1980s. In 1984, four Huangfen class missile attack craft were transferred from Beijing for about $20 million per piece. It is interesting to note that Chinese naval equipment being inferior in quality, was less desired, but Pakistan obtained the missile craft mainly with a longer term objective of striking a deal of technology transfer in the future for indigenous production of the missile craft.[33]

In the 1980s, the Pakistan Navy was more assertive in nature and started demands for strike capabilities and additional surveillance. The main sources for the naval equipment in the 1980s were the United States, UK and China. The navy managed to increase its organisational strength also in the 1980s. In 1982, the UN Law of the Sea Convention was passed and Pakistan acquired an exclusive economic zone (EEZ) of approximately 240,000 square miles. A decision was taken to raise a more institutionalised body for the protection of this vast area and consequently, the Maritime Security Agency (MSA) was inaugurated on January 1, 1987, in order to implement national and

32. Siddiqua-Agha, n. 26, pp.155-156.

33. Siddiqua-Agha, Ibid., p. 159.

international laws in the EEZ and provide surveillance.[34] Thus, Pakistan's newly acquired offensive capability was reinforced with force multipliers and missile equipped submarines. The Pakistan Navy, by the end of 1990, had sufficient organisational structures to manage its coastal defence. It had two sub-organisations for coastal defence: the Special Services Group[35] and the army's division dedicated to the defence of the coastal facilities; and the third set-up, a division of marines, was established in 1990.

NAVAL BUILD-UP SINCE 1990

The supply of American equipment was halted due to the embargo under the Pressler Amendment in the 1990s. After the Soviet withdrawal from Afghanistan and subsequent end of the Cold War, the Americans were not interested in Pakistan. The US sanctions were highly damaging in nature as not only the supply of American defence equipment but the supply of essential spares was also stopped. The scheduled American supply of the maritime patrol aircraft, helicopters and additional Harpoon and other missiles was held back. This seriously handicapped the Pakistan Navy which mainly comprised US ships. The lease for the first Brooke class frigate expired in March 1993, and of the remaining, in early 1994, and renewal of the lease was not on Washington's agenda. This was the time when Pakistan started to focus on indigenous production.

Although Pakistan was unable to acquire the American naval equipment in the 1990s, the navy received a significant share in the total major equipment procurement owing to the consistent publicity of Service requirements by the navy. It was able to swing major deals during this decade despite the army's resistance and unwilling attitude to spend on the naval budget.

Pakistan acquired six Type 21 (Amazon) class frigates from the UK in 1993-95. [Table3 (a)] The frigates being two decades old, were modernised after

34. "The Pakistan Navy Custodian of the Country's Coastline," at http://www.pakdef.info/pakmilitary/navy/

35. The SSG is the commando division of the Pakistan Navy. It is an elite special operations force similar to the Royal Navy's Special Boat Service and United States Navy SEALs. For details, see http://www.specialoperations.com/Foreign/Pakistan/SSGN.htm

fitment of some new equipment. There were plans to equip these vessels with the Chinese C-802 surface-to-surface missiles but Harpoon launchers (ex US Gearings) have now been retrofitted.[36] The deal for these second-hand British frigates was financed through Pakistan's national resources and included the spares and training. However, it excluded the Lynx helicopters used on these frigates by the Royal Navy.

Two major acquisitions were made from France in the 1990s. In 1992, a deal was signed with France for three minehunters, which included the transfer of technology for one minehunter. Minehunters were desired by Pakistan to counter the possible threat from India which possessed significant numbers of mines. The first two minehunters built in France, were delivered by 1996; the third one was built at the PN Dockyard, Karachi, with the French assistance and was commissioned in 1998.[37]

In 1994, Pakistan signed a deal with France for the acquisition of three Agosta 90-B submarines worth $950 million. The deal was financed with the loan provided by the French themselves and had to be paid in five to six years.[38] The first Agosta 90-B was inducted in the Pakistan Navy in 1999, while the second was built at the PN Dockyard and commissioned in 2003.[39] The third Agosta 90-B is under sea trials and close to being operational. The Chinese offered to transfer submarines to Pakistan but Pakistan was used to operating the sophisticated Western technology Daphne and Agosta 70, and was not keen on buying the Chinese submarines. An additional factor for the navy's inclination towards the French was that Paris apparently pledged not to sell these types of submarines to India, and, secondly, it agreed for transfer of technology to Pakistan, enabling it to manufacture these submarines at the PN Dockyard.[40]

Chinese assistance which started flowing into Pakistan in the 1980s when Pakistan was exploring alternate options for weapon supply, gathered

36. Sakhuja, n.17.

37. "Mine Hunters", PN Fleet and Establishments, at http://www.paknavy.gov.pk/ mineh.htm

38. Siddiqua-Agha, n. 26, p. 162.

39.. "Agosta 90-B", Pakistan Fleet and Establishments, at, http://www.paknavy.gov.pk/ agosta90.htm

40. Siddiqua-Agha, n. 26, p. 162.

momentum, and in 1994, a collaborative venture was initiated with the Chinese for the manufacture of gun and missile boats. Construction of the boats was carried out at the PN Dockyard and Karachi Shipyard and Engineering Works (KS&EW); while the technology came from the Chinese, the boats were fitted with components from the West.[41] Pakistan's first indigenously manufactured missile craft, PNS *Jalalat* was commissioned in 1997 and the second in 1999.[42]

In 1995, after the Brown Amendment was passed, there was some relaxation in the US embargo and, consequently, the Clinton Administration released the P-3C Orions for the Pakistan Navy, a deal for which was signed in 1988. In 1996, three P-3C Orions were inducted into the No. 28 Squadron. One of these aircraft was lost in an accident while carrying out routine exercises in 1999.

Pakistan had started the construction of small craft like coastal tankers, missile boats, Agosta 90-B submarines and minehunters with the transfer of technology from China and France. Pakistan's focus in the 1990s was to gather capacity to enhance the indigenous production as this was for the second time (once earlier, after the 1965 War) when the suspension of American supplies disturbed the military modernisation plans. Most of the deals negotiated during this period carried the component of transfer of technology which Pakistan insisted on.

Pakistan's third alliance with the United States and its role as a frontline state in the war on terror post-September 11, 2001, again opened the doors for US defence equipment. In the last six years, Pakistan has not only managed to receive Western high technology equipment but has also received tremendous military aid which enhanced its ability to modernise its inventory at a much more accelerated pace. The Pakistan Navy which has always received a marginal share in the defence budget (about 10-15 per cent of the defence budget) has finally succeeded in increasing its share and according to the latest defence budget of 2007-08, the navy's allocation has gone up by 14.16 per cent.

41. Siddiqua-Agha, Ibid., p. 165.

42. "Missile Boats", PN Fleet and Establishment, at http://www.paknavy.gov.pk/ mboat.htm

Although the American arms sale/grant to Pakistan since 9/11 has been to support the counter-terrorism operations, the bulk of it has contributed towards building up of Pakistan's conventional military capability. Pakistan ordered eight P-3Cs from the United States in 2005, out of which two have been delivered. Pakistan's request for Harpoon anti-ship missiles has to an extent been met and 88 missiles have been delivered to Pakistan.[43] Pakistan has also received six Phalanx close-in naval guns for the Pakistan Navy. Six C-130E transport aircraft were ordered by Pakistan in 2004. Other US weapon sales include the possible transfer to Pakistan of P-3B aircraft as Excess Defence Articles (EDA) that would be modified to carry the E 2C Hawkeye airborne early warning suite.

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Reports suggest that the navy has officially put up a formal request for six Oliver Hazard Perry class frigates (from the US) to augment its surface fleet.

In 2006, the Pakistan Navy ordered four F-22P type frigates from China with the value of the deal at $600 million.[44] The first destroyer, PNS *Zulfiqar*, is scheduled to be delivered in 2009, while the other three would be delivered by 2013. The F-22P, which is a modification of a Chinese frigate that uses a Russian-designed main gun rather than a Chinese model, is armed with eight C-802 anti-ship warfare missiles, eight FM-90 surface-to-air missiles (SAMs), one AK-176M main gun and two Chinese 30 mm close in weapon systems (CIWS). The frigates can be loaded with one Z-9EC helicopter.[45] The fourth F-22P will be manufactured in Pakistan at a Karachi shipyard in 2013, to fulfill a

43. "Major US Arms Sales and Grants to Pakistan Since 2001," Report prepared for the Congressional Research Service by K. Alan Kronstadt, specialist in South Asian Affairs (8/28/08), US Department of Defence, at http:www.fas.org/sgp/crs/row/ pakarms.pdf

44. Bilal H. Khan, "Pakistan Navy Modernization Program," Pakistan Military consortium, at http://www.pakdef.info/pakmilitary/navy/pn_,odernization.html

45. Khan, Ibid.

The Pakistan Navy has commenced the production of missile boats and operates four Jalalat class missile boats armed with the Chinese C-802 anti-ship missiles.

pledge to transfer Chinese shipbuilding technology that was part of the April 2005 agreement to build the frigates.

Other defence production plans on the naval front include four modern corvettes which are planned to be built alongside with F-22P in KS&EW. The navy also plans to manufacture and procure additional minehunters, tankers, missile and patrol boats.[46] Pakistan's Daphne class submarines have retired, and it has expressed the need to acquire more submarines. The navy is reportedly in negotiation with France wherein it has been offered the Marlin SSK, which is based on the Scorpene SSK, but also uses technology from the Barracuda nuclear attack submarine. The German firm, on the other hand, has offered U-214 SSK.

Atlas Elektronik Black Shark heavyweight torpedoes have meanwhile been purchased for the Agosta 90B submarine and an upgraded version of the Chinese LY-60N short-range theatre defence missile will be fitted on the F-22P frigates. Pakistan is seeking to enhance its strike capabilities and is seeking to develop the naval variants of the Babur land attack cruise missile (LACM) which could be launched from submarines, surface combatants and aircraft.

The Pakistan Navy has commenced the production of missile boats and operates four Jalalat class missile boats armed with the Chinese C-802 anti-ship missiles.

The Pakistan Navy has expanded enormously in the last two decades with imports and production within Pakistan. But, given the fact that the navy has an assortment of Chinese, American and European ships and equipment, it has enormous complexities of repair, maintenance and spares, which could prove to be a challenge in the future. The spares of the American equipment have worried the naval force in the past and now with the new US equipment

46. "Pakistan Navy" *Pakistan Defence*, at http://www.defence.pk/pakistan-navy/

being procured, the Pakistan Navy cannot be assured of the life-long US supply, given the record of the US-Pak relationship.

After a humiliating defeat in Kargil, Pakistan has been concentrating most exclusively on the modernisation of its air force and maritime strike capabilities of the navy.

The majority of the acquisitions for the Pakistan Navy have been from the US, UK and France. Supply from China has been restricted to the smaller surface ships. Naval aviation has been dependent on the French and US equipment. Although the indigenous development on the naval side in Pakistan is taking place, by and large, it remains dependent on imports due to lack of R&D within Pakistan which is directly linked to the lack of technical manpower within Pakistan.

Post 9/11, the boost to the aerial maritime strike capabilities has been mainly from France, the US and China. Pakistan, after a humiliating defeat in Kargil, has been concentrating most exclusively on the modernisation of its air force and maritime strike capabilities of the navy. Although modernisation of the Pakistan Navy was on low priority in the initial years, the last two decades have contributed significantly to the offensive capability of the navy. It will not be incorrect to say that the American alliance has always been beneficial for Pakistan, not only from the point of view of procuring high technology weapons but also because of the experience and guidance that the military receives from the West. The Pakistan Navy's involvement in the Combined Task Force (CTF-150)[47] would undoubtedly influence the navy's operational strategy and professionalism, like the Pakistan Army thinking was shaped by the American alliance in the 1950s and later in the 1980s.

NAVAL ACQUISITIONS AND STRATEGY

A review of the available data on acquisitions indicates that till the 1971 War, the major thrust of the naval strategy was sea denial, with specific offensive

47. Combined Task Force (CTF) 150, established towards the beginning of Operation Enduring Freedom comprises warships from numerous coalition nations, including France, Germany, Pakistan, the UK and US.

Pakistan, during the 1965 and 1971 Wars, deployed its surface fleet along its shores in a sea denial role and submarines in an offensive role.

capabilities. Pakistan, during the 1965 and 1971 Wars, deployed its surface fleet along its shores in a sea denial role and submarines in an offensive role. It followed a defensive strategy of guarding the sea frontiers and defending the sea lines of communication. However, it found that Indian missile boats were able to hit Karachi in spite of the sea denial strategy and deployment. Since then, Pakistan has worked towards the improvement of its structure and fleet and special emphasis has been placed on the sub-surface warfare capability in order to deny the control of sea lanes to other nations.

In the 1980s, the aid from the United States brought in the high technology equipment from the US, France and the UK. Pakistan received the Harpoon missiles, additional submarines and destroyers and, thus, managed to expand its sea denial capabilities over a larger part of the sea. Perceptions of threat from India have shaped Pakistan's procurements and it acquired minehunters to discount any potential damage which could be due to India planning to use mines in order to deter the Pakistan Navy.

In the 1990s, some weapons were acquired from China, and Pakistan started to focus on the indigenous development of the navy. With the induction of the P-3Cs and AWACS and anti-ship missiles after 9/11, Pakistan's sea denial parameters would cover most of the Arabian Sea, with reach all the way to the southern part of the Arabian Sea.

Pakistan had focussed on building its long range surveillance capability to locate and identify surface ships and submarines. Implicitly, this also means that it creates and enhances anti-surface fleet and anti-submarine warfare capabilities. The Agosta 90B submarines are equipped with the Thales DR-3000U radar warning receiver, operating in the D to K bands. The system uses a masthead antenna array with omni-directional and monopulse directional

Pakistan's sea denial parameters would cover most of the Arabian Sea, with reach all the way to the southern part of the Arabian Sea.

antennae and a separate periscope warning antenna.[48] The submarine is also fitted with a Thales underwater systems (formerly Thomson Marconi Sonar) TSM 223 sonar suite, and includes bow-mounted sonar and towed sonar arrays, SAGEM periscopes and navigation system and Thales I-band navigation radar.[49]

The P-3Cs would further build up the surveillance and offensive capability for the Pakistan Navy. In all probability, the P-3Cs that Pakistan will receive would be the upgraded systems and are likely to carry the latest equipment.[50] The upgraded P-3Cs would enable the navy to further expand its reach and role in military operations. If Pakistan gets the ability to identify submarines, then it would imply:

Pakistan Navy is developing the naval variants of the Babur LACM which has a range of 700 km.

1. It can deal with the adversary at longer ranges in all three forms of maritime warfare: anti-submarine, anti-surface and anti-air.
2. Its offensive capability would increase with the increase in its efficiency to locate the adversary.
3. The Pakistan Navy intends to challenge the Indian Navy at sea and not allow it to bomb Karachi or the new ports.

The Pakistan Navy was hit in Karachi in the 1971 War and this was a destabilising factor and, thus, they have been inclined towards continuously building up the strike capability. The Agosta 90B submarine is fitted with four bow 533mm torpedo tubes and has the capacity to carry a mixed load of up to 16 torpedoes and missiles.[51] The Pakistan Navy is developing the naval variants of the Babur LACM which has a range of 700 km and is claimed to be capable of using both conventional and nuclear warheads. The navy has commenced the

48. http://www.naval-technology.com/projects/agosta/

49. Ibid.

50. "Lockheed Martin Awarded $186 Million Contract to Upgrade P-3C Maritime Surveillance Aircraft Mission Systems for Pakistan Navy," at http://www.global security.org/military/library/news/2007/02/mil-070213-lockheed-martin02.htm

51. http://www.naval-technology.com/projects/agosta/

The navy acquired 16 combat capable aircraft by 2008 as compared to 3 (Atlantiques) in 1977-78.

build-up of fast attack missile craft and diverted significant funds towards the procurement of frigates. Reportedly, a total of 12-16 frigates will be procured by the end of 2015, resulting in substantial growth in capabilities and numbers of the major surface combatant fleet. The frigate fleet is expected to be augmented by a fleet of at least four large multi-role corvettes, thus, enhancing the range and offensive capability of the Pakistan Navy which was clearly stated by the Naval Chief Admiral Muhammad Afzal Tahir as follows:

> To this end, our frigate project has already been materialized which will commence soon with the Chinese collaboration in the region. Induction of these Fast Attack Missile Crafts in the Pakistan Navy fleet will certainly enhance its offensive punch…[52]

Table 2: Pakistan Naval Capabilities: Major Combatants

	1977-78	2007-2008
Submarines	3	5
Destroyers and Frigates	5 (4+1)	6 building – 4
Tankers	2	5
Aerial Maritime Reconnaissance, Surveillance and Strike	3 (Atlantique)	16 (including 10 P-3C)

Source: *The Military Balance 1977-78*, 2008.

In the last 30 years (see Table 2), the Pakistan Navy has expanded significantly in size as well as range and quality. The navy acquired 16 combat capable aircraft by 2008 as compared to 3 (Atlantiques) in 1977-78 (Table 2).

52.. "Pakistan Navy Inducts Tow Fast Attack Craft into Fleet," http://www.globalsecurity. org/wmd/library/news/pakistan/2006/pakistan-060224-irna01.htm

Since 2000 [Table 3 (b)], the Pakistan Navy has not only stepped up its efforts to modernise its surface sub-surface and aerial fleet and but has focussed on the build-up of aerial maritime strike capabilities. Even in the early 1990s, it possessed the second largest aerial maritime strike force in the region, and according to Indian naval experts, Pakistan was expected to have the strongest aerial maritime strike capability along the Indian Ocean littoral.[53] Also, naval capability acquired in recent years (and also planned future acquisitions) comprises high technology equipment. The US has been extremely lavish with its sales to Pakistan and also the Chinese military equipment is rapidly getting upgraded technology in keeping with Beijing's doctrine of fighting a high-tech war since the 1991 Gulf War.

Table 3: Pakistan's Major Arms Acquisitions

(a) Pre-Kargil Naval Acquisitions : 1990-1998

Year(s) of Delivery	**Weapon Designation**	**Weapon Description**	**No. ordered/ Delivered**	**Source- Supplier/ Licenser**
1993-95	Amazon-class Type 21	Frigate	6	Britain
1994-96	3 Lynx HAS-3	ASW Helicopter	3	Britain
1994	"Moawin"	Fleet tanker	1	Netherlands
1994-96	Fokker F27-200	Aircraft	5	Netherlands
1996-97	P-3C (Update 2.75)	Orion maritime reconnaissance and strike aircraft	3	USA
1996-97	Harpoon	Anti-ship missile for the P-3C Orion	28	USA
1996	Breguet Atlantique-1	MPA and strike aircraft	3	France

(b) Post-Kargil Naval Acquisitions : 1999-2007

Year(s) of Delivery	Weapon Designation	Weapon Designation	No. ordered/ Delivered	Source- Supplier/ Licenser
1999-2003	Agosta 90 B	Submarine	3	France
1999-2004	F-17P	AS torpedo	96	France
1999-2004	SM-39 Exocet	Anti-ship missile	24	France

53. Lt Sanjay J. Singh, "The Indian Navy is no Threat", *Naval Institute Proceedings*, March 1991, p.75.

Year(s) of Delivery	Weapon Designation	Weapon Designation	No. ordered/ Delivered	Source-Supplier/ Licenser
2000-2001	C-802/CSS-N-8	Anti-ship missile	24	China
2002-2006	Jiangwei	II class frigate	4	China
2002-2003	SM-39	Exocet anti-ship missile	40	France
2004	C-802/CSS-N-8 Saccade	Anti-ship missile	16	China
2004	C-130E Hercules*	Transport aircraft	6	USA
2005	P-3C*	MP and strike aircraft	8	USA
2006 (order)	Harpoon	Anti-ship missile		100 (88 USA for the P-3C delivered) Orions
2006 (order)	F-22P type	Frigate	4 (delivery 2009-2013)	China
2006 (order)	Z 9EC	Helicopter	4-6	China

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

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

The Pakistan Navy has expanded its naval bases and ports in recent years. Apart from Karachi, the other bases are Ormara, Pasni, Jiwani and Gwadar (Fig 1). Expansion of ports would provide Pakistan easy access to the Muslim countries, including the Arab nations where a large Pakistani population resides. Pakistan's Makran coast lies abeam the world's

Pakistan Navy has expanded its naval bases and ports in recent years.

most intensive oil and liquefied natural gas (LNG) supply routes. Over 51 per cent of the world's crude oil is exported through the choke point at the Strait of Hormuz. Given the rising oil prices, access to the oil supply routes is critical for energy deficient countries like China, Japan and India and, thus, the expansion and increase of naval bases would enhance Pakistan's influence in the energy and naval policies of nations. This also reduces the navy's vulnerability in future wars and also reduces its dependence on Karachi.

Fig 1: Pakistan Naval Bases

Source: "Pakistan Naval Base," at http://www.globalsecurity.org/military/world/ pakistan/ports.htm

The expansion of the Pakistan Navy and its bases would imply the following important factors:

1. The Pakistan Navy would present a much larger number of targets to the adversary.
2. The navy would reduce its vulnerability as it would be able to spread its assets.
3. It would reduce dependence on Karachi for sea trade and also reduce the probability of blockade of the Pakistan Navy and the ports during crises. (Besides this, roads through Baluchistan laterally connect its ports.)
4. By spreading its operating bases, the navy's aim is to be able to threaten Indian access to the oil supply routes.
5. The Pakistan Navy appears to be seeking strategic-doctrinal expansion from sea denial to sea control.

Gwadar, the new major port, has been developed with the Chinese assistance and the primary project has been the construction of a deep sea port, expanding its maritime role, and to allow trade to and from the landlocked Central Asia. More importantly, the port would have the conversion facilities to allow the movement of natural gas for the Turkmenistan-Afghanistan-Pakistan natural gas pipeline, when constructed. Gwadar offers the geo-economic and geo-strategic pivot to China and Pakistan. It is strategically located on the southwestern coast of Pakistan between three increasingly important regions of the world — i.e. South Asia, Central Asia and oil-rich Middle East. Gwadar, which is overlooking the Gulf of Oman and the entrance to the Persian Gulf region, is just 180 nautical miles from the Strait of Hormuz. Thus, Gwadar would eventually emerge as the key shipping hub, providing mass trade to the Central Asian Republics through Pakistan and China, and an important naval base.

Development of Gwadar port emphasises the growing Chinese influence in the region and their interest in reaching the Arabian Sea.

Development of Gwadar port emphasises the growing Chinese influence in the region and their interest in reaching the Arabian Sea. In fact, it is a manifestation of China's emerging maritime strategy, the "String of Pearls."

The essence of China's "String of Pearls" lies in port and airfield construction projects, diplomatic ties and force modernisation.[54] The "Pearls" extend from the coast of mainland China through the littorals of the South China Sea, the Strait of Malacca, across the Indian Ocean, and on to the littorals of the Arabian Sea and Persian Gulf.[55] China's involvement in Gwadar is undoubtedly a response to China's emerging energy requirements, China being the world's second largest oil importer. Approximately 70 per cent of Chinese oil supply comes from the Middle East and Africa through the sea. China is expanding its energy procurement efforts and the strategy of a series of ports along the oil shipment routes which would allow China to safeguard and monitor energy flows.

Gwadar being built in Baluchistan coast, would enable Pakistan to take control over the world energy jugular and interdiction of Indian tankers.

From the military point of view, Gwadar is a decongestion point for the Pakistan Navy and will provide it a berthing point for its submarines and surface warships. Gwadar port area has been designated as a "sensitive defence zone" by the Government of Pakistan.[56] Although, there has been no official Chinese announcement on the subject, various reports are indicative of Gwadar being a future berthing point for the People's Liberation Army (PLA) Navy fleet of the Indian Ocean, facilitating China's military presence in the region. This would add to the deterrent against the Indian Navy.

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

1. Being only 180 nautical miles from the exit of Strait of Hormuz, Gwadar being built in Baluchistan coast, would enable Pakistan to take control over the world energy jugular and interdiction of Indian tankers.

54. Christopher J. Pehrson, "String of Pearls: Meeting the Challenge of China's Rising Power Across the Asian Littoral," July 2006, at www.strategicstudiesinstitute.army.mil/pdffiles/PUB721.pdf

55. Pehrson, Ibid.

56. "PNS Gwadar," at http://www.globalsecurity.org/military/world/pakistan/pns-gwadar.htm

2. The pressure for countries to cooperate in the maritime military domain to ensure smooth flow of energy and commerce on the high sea will grow even further.
3. A highway is under construction joining Gwadar with Karachi and there are plans to connect the port with the Karakoram Highway, thus, providing China a gateway to Arabian Sea.[57]

The US has had an abiding interest in maintaining influence in, and over, Pakistan. Pakistan's alliance with the US and its status of "frontline state" (for the third time in half a century) in the war on terror has not only brought in modern American equipment but also the thinking of the navy has been influenced due to American involvement in naval exercises. For example, the Pakistan Navy is a part of the CTF 150 and would essentially gain professional and tactical experience working with the navies of the NATO countries. The main stated purpose of the CTF 150 is to deny the use of the sea to terrorists. It conducts Maritime Security Operations (MSO) southwest of the Strait of Hormuz in the Arabian Sea, Gulf of Oman, Gulf of Aden, the Red Sea, and patrols the Indian Ocean.[58] American interest in the Pakistan Navy, in fact, goes back to the 1980s, when America funded the development of Pakistani ports on the Makran coast. In 1983, the US created the Central Command to deal with about 22 Muslim countries. After the end of the Cold War, the US actually closed down 22 foreign bases in Asia, including those in Philippines, but, on the other hand, it established a new fleet for the Persian Gulf.

The Pakistan Navy has been in the process of major expansion in size as well substantive upgradation of its technology.

In conclusion, it is clear that the Pakistan Navy has been in the process of major expansion in size (with its major combatants having more than doubled in the past 20 years) as well substantive upgradation of its technology. Some of

57. http://intelligencebriefs.blogspot.com/2008/01/

58. "CTF 150 Helps Maintain a Lawful Maritime Order", at http://www.navy.mil/search/display.asp?story_id=37530

the latter is inevitable with the passage of time. But what is of significance is that the focus of the trend is on extending the combat radius of the Pakistan Navy, while laterally broadening its naval deployment bases along the full length of the Makran coast. In turn, one can argue that its traditional strategy of sea denial has been expanding to larger ranges and greater offensive capability that would increase both its sea denial and well as sea control roles. In specific, it is now focussing on a dramatic increase in its maritime surveillance and strike potential to ranges that could extend as far as south of the Arabian Sea with modern anti-ship sea-skimming missiles.

The political implications of potential influence/ control by Pakistan on the sea routes between India and the Gulf ports would have to be carefully examined.

Pakistan has been building up more deep sea ports along the 700-odd-km Makran coast. The most significant of these is the Gwadar port recently expanded to much larger capacity by China than the originally upgraded port undertaken with US assistance in the 1980s. China's motive in dramatically expanding the capacity of this port is an issue of international attention and mostly interpreted in terms of China's strategy of "String of Pearls" in areas far from its territory. But what is perhaps of greater significance for India is the implication of a much expanded and technologically advanced Pakistan Navy deployment at the port abeam the major trade and oil transportation routes, besides its proximity to the Strait of Hormuz through which passes more than 50 per cent of the world's crude oil. The bulk of India's oil supplies coming from the Persian Gulf through this choke point would then pose a new challenge of vulnerability that would have to be addressed on priority. Similarly, more than four million Indian expatriates work in the Arab states of the Gulf region. The political implications of potential influence/control by Pakistan on the sea routes between India and the Gulf ports would have to be carefully examined.

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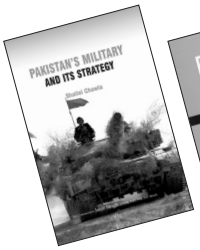

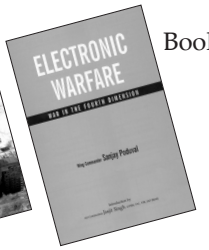

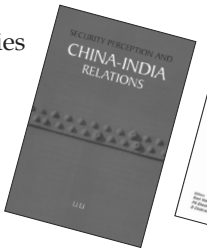

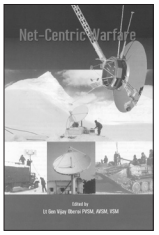

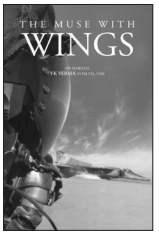

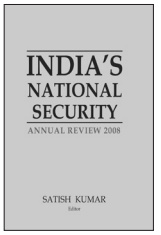

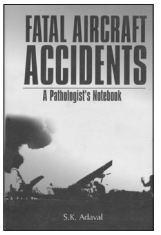

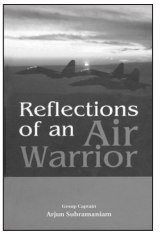

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WEAPONISATION OF OUTER SPACE AND NATIONAL SECURITY: FAULTLINES IN THE LAW

G. S. SACHDEVA

Man has arrived at the final frontier and further advances in space technology are happening rapidly. As a result, multi-dimensional exploration and exploitation of outer space fall in the realm of feasibility—technically, economically and politically. Accordingly forays into outer space are increasing exponentially and use of this medium is becoming progressively extensive. This leads to an urgent need for maintenance of proper order in outer space through suitable laws governing its use without conflict and with cooperation.

The existing legal regime of outer space permits equal freedom to all nations for scientific exploration and for peaceful uses of outer space and celestial bodies. But only a few nations have the financial capacity and technological capability to undertake outer space ventures. Fortunately, India is a space-faring nation that has taken advantage of space activities for the welfare of its people and to improve their quality of life. India has fairly shared the benefits of scientific experimentation of, and with, the world at large. It, thus, has viable stakes in the regulation of space activities and the law of outer space.

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There is no gainsaying the fact that, historically, activities in outer space were an offshoot of the arms race and a corollary to the development of missile defence projects like anti-ballistic missiles (ABMs) and anti-satellites (ASATs), by the superpowers, controlled and operated under the military domain. Hence, it seems natural that these powers should have had futuristic plans to exploit outer space for their national defence imperatives or security cover for their strategic allies. Not surprisingly, they have already undertaken programmes, and have more in the pipeline, for offensive and defensive systems. In either case, the risk of weaponisation of outer space is rife and rampant.

In contrast, as the number of countries using space for developmental needs grows, not all of them will have the capability to build effective defence mechanisms to ward off attacks from outer space. Even those that do place weapons in space cannot escape the vulnerabilities since the time and direction of attack would be of the enemy's choosing, thus, leaving little reaction time for detection of the assault and activation of defence instrumentalities to neutralise the weapons before they hit the target. Incidentally, the scenario takes the parameters at face value and does not doubt the efficacy, or precision, or success rate of the ABMs or ASAT weapons.

Further, it is also important to factor in the necessity of engagement for neutralisation over that part of the globe where it shall have the least harmful impact on man and the planet earth. One can only wonder if such precision and control can possibly be exercised and achieved in real-time situations. This predicament can be extrapolated for the attacker to consider whether the weapons of mass destruction (WMDs) released from a space station or orbiting platform would have the precision to so accurately home onto the target that it would cause no collateral damage to unintended areas and innocent beings. Or what would be the level of certainty and safety that such weapon

As the number of countries using space for developmental needs grows, not all of them will have the capability to build effective defence mechanisms to ward off attacks from outer space.

would not suffer a malfunction or a technical failure to become a rogue satellite and, thus, cause unimaginable damage in outer space itself, with unintended consequences, or hit other than the programmed target on the earth, and cause considerable grief and regret? This paradigm certainty evades an exact answer and no guess shall be totally wrong.

Ironically, the illusion of an impenetrable defence shield stems from a belief that there are purely military answers to problems of security, whether on land, sea, air or outer space.

Ironically, the illusion of an impenetrable defence shield stems from a belief that there are purely military answers to problems of security, whether on land, sea, air or outer space. In the armed forces, it is a cliché that political policy ends where military strategy begins. But this premise is outdated in the 21st century international order where political overtures and multi-track diplomacy are equally good and efficacious alternatives and there is greater need for a synergistic approach. Responsible nations realise that a war is a war and even when waged through outer space may leave no reason for the victor to rejoice because second strike capabilities, used in reprisal or revenge, may be equally lethal and devastating. The subsequent loneliness of the winner, if surviving, may only be suffocating and his repentance ageless.

CURRENT SCENARIO IN OUTER SPACE

It is now quite clear that space assets can be used as real-time informers for war-theatre dominance and, thus, can really influence the outcome of battles as also facilitate monitoring of combat area operations. The importance of space satellites for their speed of surveillance, precision in pinpointing enemy positions, accuracy of information and transmission of data back to the earth station for analysis and conversion to command instructions and accordingly influence operations in a matter of seconds is of tremendous and decisive advantage. The synergy, thus, created in collaboration with earth-based systems can be amazing. Consequently, concepts of command and control have undergone a sea-change. Speedy decision-making based on real-

A separation of exclusive military and purely civilian satellites is difficult by definition and may even be misleading.

time information is of the essence and precision targeting with smart munitions helps minimise collateral damage. No wonder, outer space provides the traditional high ground for observation with spectacular advantages in augmenting the military might. And this temptation is difficult to resist.

Today, it is a *fait accompli* that outer space has been militarised. Satellites offering dual use, where either the military lends facilities for civilian utilities or private assets in outer space partly undertake military missions, are common and numerous. Thus, a separation of exclusive military and purely civilian satellites is difficult by definition and may even be misleading. To compound the situation further, the number of mixed assets in outer space is likely to grow exponentially in the future. The stage where outer space was a protected sanctuary for scientific exploration and peaceful activities is long over. Space has been "militarised" already by both military and commercial satellites. And there is clamour for broad-based and enhanced defence capabilities and diversified service products from space assets. It would, therefore, be naive and futile to expect to roll back the clock.

It may instead seem more sensible and fruitful to urge, for the future, a total and absolute ban on active strike vehicles, loosely called "shooters" to operate in and from outer space. These vehicles could be of any kind or denomination, but with military connotation and for strategic or tactical offensive purpose, operating from or through the jurisdiction of outer space so as to de-orbit for an attack on an earth-bound target or hit another asset in space. These may have the capability to directly launch loaded projectiles or space cannons or lay space mines or shoot directed-energy beams at targets on the earth for destruction, with an aim that could be offensive or defensive. These shall bear pure military strike usage of hit-to-kill and would not be expected to render any civilian utilities. A few examples of these could be the US ABM system or ASAT system.. The Soviet intercontinental ballistic missile (ICBM) instrumentality called fractional orbital bombardment system (FOBS)

or polyus orbital weapon system, with self-evasive sensor blinding laser, would also have fallen into this category.[1] The prohibition should include testing and deployment also. Similarly, the vice versa, in which high powered ground-based (includes air and sea) laser beams that can be used to attack and destroy satellites orbiting, emplaced or stationed in outer space should also be banned with equal vehemence.

For a better understanding of the origin and purpose of non-strike or passive satellites, it would help to list the popular classification related to their non-lethal use. These generally fall into two categories –communication satellites and sensor satellites—that are primarily for knowledge gathering or situational awareness. These can easily be exploited for both military and commercial value. The military roles would comprise reconnaissance, surveillance and communications. Other uses may be to virtually connect the battle ground to the combat commanders with real-time information through multi-media facilities. Such a high-speed informational grid and dedicated internet already exist and are operational for the US military. These are still considered as auxiliary aids for defensive assistance though these do augment power synergy. Hence, these are not dubbed as offensive-strike space weaponry. Reliable estimates categorically put these at about 200 such passive assets in outer space, while according to best guesses, it perhaps, seems that so far there are no shooters or strike weapons in space.[2] However, accelerated development work is currently under way for space-operations vehicles, space-based radar and laser, space cannons, space mines (nuclear or conventional) and adaptive optics. Breakthroughs are in the offing. Significant accomplishments are also expected in the field of EELV, that is, evolved expendable launch vehicles.

Accelerated development work is currently under way for space-operations vehicles.

1. SALT-II Treaty of 1979 prohibited the deployment of this system.
2. Information on this subject matter is a classified state secret and is rarely made public by governments. This is only an authentic estimate. For latest details, please refer *SIPRI Yearbook*.

Amongst the civilian uses, the communication satellites facilitate GPS (global positioning system) which provides precision in time and positional coordinates. This service is now widely used for navigational purposes and traffic control in the air, at sea and on the ground. Its uses seem to be versatile and ever expanding. The military has also made copious use of this innocuous facility for GPS-aided weapons and GPS-aided guided munitions as also fighter control in battle areas, particularly in the Kosovo War and the Iraq conflict. GPS is aptly suited for monitoring ground troop movements as well as search and rescue missions because of its high accuracy on grid-references.

The US military refers to this system as NAVSTAR-GPS or navigational signal timing and ranging global positioning system that provides exact location and highly accurate time reference almost anywhere on the earth. This network uses a constellation of 24 satellites operating in an intermediate circular orbit (ICO). This system was made operational in 1989 and is controlled and maintained by the US Department of Defence. This facility is provided free of charge worldwide but was subjected to the doctrine of selective availability by a presidential directive announced on May 1, 2000. This proclaimed that the facility can be restricted, selectively jammed or denied, even for civil purposes, during belligerence or global alert issued by the US. The European Community is wary of such a possibility and has expressed serious concerns resulting in efforts to develop the Galileo Positioning System for the commercial and civilian needs of the European Community. Russia also operates an independent system called GLONASS, since 2004, but with limited and specific usefulness.[3]

Another usefulness of communication satellites lies in cellular networks that are progressively providing wireless, multi-media facilities, that, thus, afford digital voice transmissions and near-real-time data transfers. The military makes use of these systems for communication eavesdropping signal intelligence (SIGINT) or for covert communications human intelligence (HUMINT). Such military operations exist in peace-time as well as in war-

3. From Wikipedia.

time. Thus, space communication, indeed, covers a wide spectrum of service products. Its further applications and other ramifications are expected to grow exponentially and that too, very soon.

The space-based laser system, currently under development and proving, is certainly a reality for the future space-weapons arsenals.

The second category comprises sensor satellites, like SBIRS (space-based infra-red systems). These bear peaceful uses of imagery for remote sensing, geodetic surveys, mapping and data for meteorological conditions. These are also being operated as space-sensor-platforms for military reconnaissance, surveillance and early warning systems to ensure a robust national defence missile cover. The existence of espionage satellites is tacitly accepted by both superpowers and is so enshrined in the SALT-I agreements. That military intelligence uses high-resolution photography for imaging intelligence (IMINT) is also well known. Thus, such satellites contribute to battle-characterisation, technical intelligence and overall space dominance with extra-refined information and speedy crunching. The space-based laser system, currently under development and proving, is certainly a reality for the future space-weapons arsenals. It is anticipated that it shall be able to deliver and inflict horrendous lethal punch.

LEGAL ORDER IN OUTER SPACE

It is heartening that the two superpowers should have shown great understanding during the tense Cold War years, reposed reasonable confidence in each other and built mutual trust to negotiate and conclude some of the most contentious treaties that strictly prohibit military activities and placement of WMD in outer space. Mankind, perhaps, realised its stakes in MAD (mutually assured destruction) acts and appreciated the advantages of cooperative living and common survival.

Regimen of the Outer Space Treaty

The basic legal regime of outer space is enshrined in the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space,

Including the Moon and Other Celestial Bodies, popularly called the Space Treaty of 1967. The general tenets of the treaty, as relevant for our purpose, can be paraphrased for analysis as follows[4]:

1. Outer space, including the moon and other celestial bodies, shall be free for scientific investigation, exploration and use by all states without discrimination and on the basis of equality and shall facilitate and encourage international cooperation (Article I).
2. Such exploration and use of outer space shall be carried out for the benefit and in the interest of all countries and shall be the province of all mankind (Article I).
3. Outer space, including the moon and celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means (Article II).
4. Activities in outer space, including the moon and other celestial bodies, shall be carried out in accordance with international law, including the charter of the United Nations, in the interest of maintaining international peace and security (Article III).
5. Parties shall not 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 weapons in outer space in any other manner (Article IV).
6. Activities in outer space shall be guided by the principles of cooperation and mutual assistance, with due regard to the corresponding interests of all other parties and to avoid their harmful contamination and also adverse changes in the environment of the earth (Article IX).

Complementary Provisions in Other Treaties

The Moon Treaty also desires "to prevent the moon from becoming an area of international conflict" and declares that all state parties shall use it "exclusively for peaceful purposes." This, by its very text and syntax, precludes any hostile or conflictive acts or threat thereof in relation to the earth and the moon and

4. The text of the treaty Articles is not complete. Only relevant extracts have been taken.

"shall include orbits around or other trajectories to or around it."[5] Interestingly, the Moon Treaty also ordains that parties "not place in orbit around in other trajectory to or around the moon, objects carrying nuclear weapons or any other kinds of weapons of mass destruction or place or use such weapons on or in the moon." This prohibition appears broader and stricter because it further forbids "[t]he establishment of military bases…the testing of any type of weapons and the conduct of military manoeuvres on the moon…" Of course, the use of military personnel, equipment or facility is not banned but is allowed only "for scientific research or for any other peaceful purposes…" on the moon.

The use of military personnel, equipment or facility is not banned but is allowed only "for scientific research or for any other peaceful purposes…" on the moon.

It would also be pertinent to mention other allied treaties or agreements that, in tandem, prohibit weaponisation of outer space on any one of its aspects or purposes. In this context, the ABM Treaty 1972 between the US and the USSR that put a moratorium on the development and testing of anti-ballistic missiles deserves to be alluded to. This treaty placed limits on deployment of ABMs at *status quo* as these missiles operate through the jurisdiction of outer space. Incidentally, the technology involved in such systems was nascent then, and shaky, at best. But the agreement was futuristic and, of course, laudable for its noble intent and mutual assurance. The US has reneged on this since 2002.

Later, when ICBMs came of age, and the debate on Star Wars was in heat with the possibility of Soviet FOBS (fractional orbital missiles) becoming functional, the SALT-II Treaty was signed in 1979. This specifically provided, "Each party undertakes not to develop, test or deploy…..systems for placing into earth orbit nuclear weapons or any other kind of weapons of mass destruction, including fractional orbital missiles." This had assured the world

5. The Moon Treaty is the popular abbreviation for the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of 1979. This was adopted by the UN General Assembly by Resolution 34/68 of December 5, 1979. Text within brackets has been taken from the treaty.

with much relief that MAD had been routed and averted for the time being. This treaty endorsed what was there in the Space Treaty of 1967 (Article IV) and reflected the contemporary thinking enshrined in the Moon Treaty of 1979 (Article 3).

Evaluation of Legal Safeguards

Despite a specific and strict ban on such military uses and emplacement of weapons of mass destruction in outer space, the existing corpus of space law grants some special permission and leaves certain grey areas that are exposed to promiscuous interpretation or lend themselves to ambiguous meaning. These create chinks and chasms in the legal shield of outer space. As a result, some strategic defence projects are being experimented with, and activities undertaken, by a few chauvinistic space powers, ostensibly, for legitimate reasons or patently licit purposes yet their *bonafides* are in the umbra of doubt. Hence, the faultlines in the law of outer space are becoming easily discernible and more prominent. Let us consider a few examples to buttress this point and vindicate the above thesis.

First, the Outer Space Treaty (OST) asserts that outer space, etc "shall be the province of all mankind" and permits exploration and use therein "for the benefit of and in the interest of all countries" and with "freedom of scientific investigation" to "facilitate and encourage international cooperation." Such laudable clauses in the avowed interest of world peace hardly brook any breach or use of outer space for ignoble causes of star wars or aiming targets on the earth from heights in outer space. The illegality in placement of WMDs in orbit or space stations or platforms in outer space is evident and crystal clear. Weaponisation can, by no stretch of the imagination, be construed "for the benefit of and in the interest of all countries" or that it would "facilitate and encourage international cooperation." The fallacy is apparent that

The existing corpus of space law grants some special permission and leaves certain grey areas that are exposed to promiscuous interpretation or lend themselves to ambiguous meaning.

such offensive activities having a destructive effect undoubtedly violate two fundamental precepts of the treaty – the peaceful purpose and the benefit of mankind clause. Therefore, enhancement and institutionalisation of the primacy of the mandated norms have become vitally important and of dire urgency. Else, extinction stares us in the face.

Pursuit of cooperative overtures towards common security in outer space, as a strategic initiative, casts a legal obligation that by implication carries the force of customary space law.

Secondly, in the context of the Outer Space Treaty, the concept of cooperation and common security assumes obligatory importance. This obligation gets endorsed, in the post-Cold War era, by the Joint US-Russian Declaration adopted at the summit of May 23-24, 2002, wherein both sides undertook to cooperate to meet security challenges and embark on a cooperative strategic transition towards common security. It seemed a noble vow and a solemn pledge by the two superpowers. It was tantamount to an expression of their earnest desire for sincere endeavours in this direction and can be deemed to bear effect as *erga omnes*. This declaration should have realised into "mutual assured security" and ensured *de facto* halt of offensive military uses of extraterrestrial space.

It can also be argued that the cooperation and "transparency" clause of Article X of the treaty that assures "an opportunity to observe the flight of space objects launched" by other states, cannot accommodate the secrecy of clandestine offensive activities. Moreover, the mandate of "peaceful activities" under the treaty does not brook security threats or aggressive acts in or from outer space. Therefore, pursuit of cooperative overtures towards common security in outer space, as a strategic initiative, casts a legal obligation that by implication carries the force of customary space law.

Thirdly, OST prohibits placement of weapons of mass destruction in the earth's orbit or on celestial bodies. But some scholars have pointed out that though placement is banned, yet constant orbital does not, *in strictu sensu,* brook this embargo as it does not constitute placement. The concept of placement is relational in geographical dimension and controlled orbital

Over the years, perceptions of self-defence have changed and notions of threat have blurred.

disturbs its relevance. Further, nor do conventional bombs of earth-vintage (KKVs),[6] that are ultimately intended to be effective for damage on the earth and to earthlings, get banned by this narrow provision. The cleavage is, thus, wide open and revealing.

Fourthly, OST ordains that activities in outer space, on the moon and other celestial bodies shall be carried out in accordance with international law, in particular the Charter of the United Nations, et al, in the interest of maintaining international peace and security. And this law permits aggression in self-defence or even under threat thereof.[7] Legal experts have long wrestled with the true meaning and actual intent of the self-defence clause. The erudition of the scholars is commendable, but they tend to forget their professional burden implied in the maxim *ex vinculus sermocinatur*. This enjoins that the treaty must be interpreted in good faith and in its ordinary meaning. This duty is also cast under the Vienna Convention on the Law of Treaties, 1969. We can ignore this prime principle only by betrayal of our conscience and at peril to humanity.

Over the years, perceptions of self-defence have changed and notions of threat have blurred. There has been, in the past, little condemnation of pre-emptive attacks nor have aggressors shown any compunction in flouting the universal norm in the "principle of proportionality" in relation to the use of force. That the US could use its armed forces unilaterally or in concert when it felt threatened by the phantomised potential of Iraq or instability in Kosovo clearly exhibits that superiority in military prowess is the sole argument and justification. Spatial separation and geographical distances tend to lose their relevance. Even the UN could not live up to its ideal objectives. International conscience seems to have been routed badly and torn asunder.

Fifthly, it is of interest that the Moon Treaty[8] also endorses the above

6. Abbreviation of kinetic-energy kill vehicles.

7. Article 51 of the UN Charter

8. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 1979. It was adopted by the General Assembly by Resolution on December 5, 1979. It is popularly referred to as the Moon Treaty.

provisions of the Space Treaty and other international agreements. In fact, it further asserts "…establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on the moon shall be forbidden." But the Moon Treaty simultaneously permits that "… use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration and use of the moon shall also not be prohibited." This concession has endemic potential for masking illegitimate activities in outer space and on celestial bodies. The paradox is clear and manifest. The inclusion of this appears advertent with mischief ingrained therein. And in the absence of verifiable controls and guarantees as well as effective monitoring by regular inspections by an autonomous agency, even promiscuous deployment of military personnel would be deemed licit and unobjectionable. Hence, this provision needs suitable riders to stem clandestine acts or obtain stricter assurances.

Sixthly, terrorism is another new dimension to the safety of human life and assets in outer space as well as security of states on the earth. The number of rogue organisations and states sympathetic to them, overtly or covertly, are multiplying rather fast. It has globally afflicted the human psyche and instilled fear in the minds of people. The apprehensions of the US in this regard are manifest in their paranoia and constant craving for impregnable security mechanisms. Typically, the terrorist strikes can be of their choosing of time, place and method. This threat is likely to permeate space activities and would become real and tangible sooner than expected. Hence, the world community needs to be alert against such contingencies and is urged to be heuristic in its thinking to prevent such incidents. Because the damage caused by such acts may be substantial and irreversible in outer space or on the celestial bodies, with resultant adverse impact on life and ecology on the earth. Fortunately, this threat is yet to become perceptibly manifest, but proactive thinking and cautious vigil are called for.

Lastly, another deficiency that assumes great importance is the absence of definitions in the treaties relating to outer space and celestial bodies. It is common

Even the best of legal statutes can be defeated in their intent and purpose due to sheer lack of definitions of operative words or for any ambiguity therein.

knowledge in diplomatic circles that definitions are the most difficult part of negotiation in any treaty, yet their necessity cannot be underrated. It is axiomatic that even the best of legal statutes can be defeated in their intent and purpose due to sheer lack of definitions of operative words or for any ambiguity therein. The same delinquency prevails in the Space Treaty that makes it susceptible to equivocal interpretation and, at times, untenable construction of its provisions resulting in foiling the laudable motives of the treaty. Of course, undue promiscuity in legal interpretation, in utter disregard of the very objects of the treaty, is indeed highly reprehensible yet the state parties do get tempted in their vested interest and own advancement.

The generic terms and phrases used in the Space Treaty are outer space, weapons of mass destruction, placement in orbit, demarcation of outer space, peaceful purposes, militarisation of the moon and other such operative terms. For example, the pith and substance of this treaty is to guarantee undisturbed activities for peaceful uses of, and scientific exploration in, outer space with equal opportunity and freedom to all countries. Normally, this basic tenet of the treaty succumbs to no ambiguity whatsoever, but unfortunately, many activities in contravention of this stated principle have taken place. Powerful nations have clearly failed in the noble mission presented by the UN and blasphemied their sacred commitment to mankind. In fact, it should be considered as utter defiance of a legal commandment, with attendant consequences.

A FEW PROPOSALS

Amendment of Space Treaty

From the foregoing analysis, a few proposals can be deduced. First, the Space Treaty should be amended to incorporate a clause in the first paragraph of Article IV. The proposed clause should strictly prohibit use of outer space by any vehicle intending to aim or shoot-to-kill any target on the earth, whether

for defensive or offensive purpose. This restriction should be absolute so that man keeps his mischievous activities confined to the immediate limit of the atmosphere contiguous to the earth. The precincts of outer space should be kept pure from the banal intent of man and "sanctuarised" for purely peaceful activities and knowledge-driven scientific explorations in the interest of international peace and for the common benefit of mankind. This should rightly constitute an agenda for the UN.

In an idealist vein, it could be further suggested that no weapon or any other instrumentality should be deployed and activated from any base located on the earth to shoot at, or immobilise, or destroy any vehicle in orbit or stationed in outer space. This would mean that no assets operating in outer space shall be aimed at from the land, sea or air. The inverse of this proposition could be deviously interpreted to imply that aggressive actions to neutralise threats or offensive activities in outer space could possibly be initiated by vehicles operating in outer space. But this again is not permissible. It is a travesty of the tenets of the Space Treaty that permits only peaceful activities in outer space.

The above proposal, however, begs a question that has remained unanswered so far. This relates to the demarcation of the boundary between air space and outer space. Long and tortuous negotiations have repeatedly failed to throw up a consensus. Diverse criteria have been mooted but rejected for different reasons. For example, the altitude where the earth's gravity ceases to exist and weight loses its manifestation. It appears rational and objective but gets tenuous due to variations in gravity at the poles and over other parts of the globe. Another standard for this frontier was based on minimised usefulness of ambient air as an agent for combustion and generation of energy. Though the consideration appears pragmatic, the variability in the thickness of the air envelope makes it unsuitable due to the lack of uniform altitude.

Yet another desideratum can be the theory of perigee of satellites. This fixes the boundary where projectiles can begin to move without the help of air, that is, by their own force of inertia. Inversely, it approximates the height where the density of air is so reduced that aerodynamic displacement ceases

to exist. This criterion appears practical but the limit becomes variable as it is affected by the rotation of the earth and unequal distribution of the masses of water and land on the surface of the earth.

Soviet scholars have suggested the fixation of vertical air boundary on the basis of defence and security imperatives. But ever-advancing arms technology renders such limit impermanent and obsolete too soon. The Western pedagogues have recommended the altitude demarcation consistent with the power of the arm or the ability of the nation to patrol and monitor or exercise effective control over its sovereign air space. This concept is patently discriminatory and bears endemic ambiguity. The limit becomes differential due to varying levels of technological development in different countries. It, thus, lacks uniformity and seems speculative.[9]

There are also zonal theories based on geo-physical characteristics of the air space where efficient navigation is possible and outer space that is deficient and non-navigable. These postulate the existence of several distinguishable zones that can be indisputably delineated. But scientific reality belies this claim. Hence, the most pragmatic suggestion comes from von Karman, who recommends, based on Kepler's Laws, the fixing of a primary jurisdiction line at an altitude of 100 km. Despite its weaknesses for scientific and political reasons, it can safely be taken as a starting point till greater consensus is evolved and may be fixed as an *ad interim* boundary between the air space and outer space. Even if a margin for operational error has to be conceded, this height would be fairly protective of the true outer space and would considerably reduce offensive incursions as also provide a benchmark to identify violations and label them as intrusions in defiance of the law.

Greater Role for the United Nations

The next proposal relates to according of a greater role to the UN in the regulation and management of activities in outer space so as to render the concerns about national security redundant and defunct. In the space age,

9. Also refer G.S. Sachdeva, "Sovereignty in the Air—A Legal Perspective," *Indian Journal of International Law*, vol. 22, no. 3&4, July-December,1982, pp. 417-418.

one is not comfortable articulating about national security. It seems petty and smacks of parochialism. Astronauts have repeatedly asserted that the planet earth looks like a small ball when viewed from a not too distant earth orbit and political lines separating countries are hardly discernible. Yet the entrenched existence of political divisions on the globe cannot be wished away so easily. It could only be an evolutional change and it may be generational.

Further, the concept of national security stems from political sovereignty that was zealously guarded by nation-states of medieval times. In the contemporary world scenario, the notion of absolute sovereignty has been undermined and diluted for reasons of economic globalisation, advances in communications and information technology, space satellites impinging on national air space and other compromises on polity in a skewed multipolar world. The complexion of national sovereignty has drastically altered and its dogmatic adherence no longer prevails. A logical deduction thus makes national security a misnomer in relation to a "cosmosised" earth. Man needs to outgrow such narrow connotations and constricted mindset to revert to his generic roots of mankind.

With fervent hope, one can imagine the UN in an ideal role of world government presiding over a stable world order. It may not irk to reiterate here that the Space Treaty ordains that outer space and celestial bodies shall not be subject to national appropriation by claims of sovereignty and shall be the province of all mankind. Further, all activities therein are to be carried out for the benefit and in the interest of all countries. This idea approximates to the common heritage, or better still co-parcenary, of mankind, and trusteeship of this corpus can confidently be put with the UN to be acted upon ideally and in the broader interest of mankind as a whole. It may also be mooted to extend the concept of eminent domain of mankind over outer space and celestial bodies and the UN be appointed as a regulator of space affairs. The idea may appear rather abstract, yet it can be debated and opinion formulated. This may also smack of an exalted ego of man, yet good governance of outer space too is a solemn duty towards God and humanity. Leaving the domain of outer space to chaotic competition, unsustainable commercial exploitation, unchecked

The UN definitely needs to assume greater responsibility in regulation and management of space activities.

weaponisation and fierce military intrusions may usher in anarchy, with ensuing suicide of the human race. Therefore, we are duty bound to establish good public order in outer space, and under the present circumstances, till a better alternative is evolved, the UN is aptly suited for the job.

Be that as it may, the UN definitely needs to assume greater responsibility in regulation and management of space activities. The secretary general of the UN, through OOSA (Office Of Space Affairs), as deputed in various treaties relating to outer space, cannot effectively discharge the assigned duties and growing responsibilities. Therefore, there is dire need for a specialised organ that may be called the World Space Organisation (WSO). In fact, in the late Seventies of the last century, a move was afoot to establish an International Satellite Monitoring Agency (ISMA), which has not yet had a tryst with success. The then proposed role and functions of the ISMA, in the contemporary scenario, appear limited and unequal to the overgrown task. Hence, the impetus for ISMA may merge into the WSO as a full organ of the UN.

The WSO may contemplate to work on the lines of the International Civil Aviation Organisation (ICAO), but the different legal regime of outer space, registration of space vehicles launched, dissemination of information, need for space traffic control, curbs on space pollution, requirements of inspection of facilities in space and celestial bodies, issue of IPE or space travel documents and other cognate duties amply justify the need for a separate organ of the UN. This organisation needs to bear a futuristic perception, engage in prudent management, ensure transparency in its actions and judiciousness in the exercise of sanctions. The urgency for the establishment of such an organisation is obvious and its functioning should commence the soonest, lest it is overtaken by events and presented a *fait accompli* with a heavy burden of pollution and rogue activities in outer space. Wisdom dictates a prompt and suitable response. It is a vision that deserves to be evolved and nurtured.

As a corollary to this proposal, it may be suggested that the UN or WSO may consider levying a pollution cess on space vehicles launched into outer space. The quantum of cess may be determined on the basis of the vintage of the technology and its sheddable stages, weight or life of the satellite or the purpose of its mission, whether public, private, commercial or military. The justification of cess stems from the fact that space vehicles make use of the heritage of mankind and enter an area that is the province of entire mankind. We owe its sustainability to our future generations also. We should not defile this trust. The cess funds so generated could be used to encourage development of technologies for retrieval of defunct satellites or scavenging of outer space or sustenance of the space environment. This would help reduce chances of accidents and make space travel safer.

Active Diplomatic Initiatives

The anguished concern about weaponisation of outer space is genuine and worldwide. The angst of self-annihilation even by an inadvertent mistake or chance occurrence is real and looming large on mankind. This threat can only be abolished by conscious acts of "de-weaponisation" and strict adherence to laws. The choice is ours to make, either with sanity and sagaciousness or foolhardy egotism.

There are some movements that are trying to infuse sense and sensitivity about the dangers of an arms race in outer space but their efforts need encouragement and augmentation from all concerned. For example, a Space Preservation Treaty was proposed in the UN General Assembly on December 6, 2006.[10] This treaty enjoins a ban on all space weapons in an endeavour preventan an arms race in outer space. Of course, the embargo is total and wide ranging but a chronic ailment needs equally drastic remedies because placebos cannot cure an acute malady. The opposition of the US to this resolution was to be naturally expected but it was consistent and more vehement than a symbolic ritual. Obviously, then, one cannot be optimistic

10. Resolution presented at Meeting 67 of Session 61. Verbatim Report is available on http://www.undemocracy.com.

about its ratification in the near future. More lobbying and greater convincing skills are wanted.

Another recent step in this direction was taken by Russia and China when they sponsored a draft Treaty on the Prevention of Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects in the UN General Assembly in February 2008. The treaty is worded in simple terms, directed clearly at the objective of preventing placement of weapons in space, yet it falls short of the ultimate aim of total disarmament in outer space. Also, while it seems fairly unambiguous because the operative words have been defined, it nevertheless, does not prohibit the research and development of anti-satellite weapons. Also, it is silent on the use of weapons from the ground, such as jammers or blinding lasers, to interfere with the functioning of satellites in orbit. Further, though this proposal assures that it does not impede the right to explore and use space for scientific and peaceful activities, it also proposes to restrict the sovereign right to self-defence in accordance with Article 51 of the Charter of the UN. Experience has shown that promiscuous invocation of this Article through liberal interpretation leads to unjust rationale that can elicit dangerous consequences whether it be on earth or in outer space or on celestial bodies. The treaty evoked no more than a lukewarm response at the Conference on Disarmament, the main negotiating body for such treaties. The US, meanwhile, has been consistent in insisting that it visualises no impending threat of weaponisation of space and, hence, dismisses the need for any action in the direction.

However, it is incumbent on the international community that for safe and unhindered access to outer space for peaceful uses, governments are prodded into acting before the dangers are actually upon us. As the old adage goes, it is easier to achieve collectively and equally easy to nip an evil in the bud rather than let the dragon rear its head and then use the knight's armour. Space weaponisation is still in the budding process. We only need to select our options sagaciously and strive with unity.

CONCLUSION

It is understandable that the law cannot be prescient of technological advancement and consequent impact on human life. Yet, it need not be a laggard and should be responsive to likely contingencies before any damage is caused. Therefore, space law needs to be proactive and futuristic in its reach and gamut. Outer space is being explored and experimented in at a very fast speed and unexpected eventualities are unfolding themselves at a rapid pace. The relevant law should march in step, anticipate ensuing moves to provide appropriate solutions on time, rather than offer lame regrets later. The legal fraternity needs to expedite treaty-making processes and compress the preceding negotiations on contentious issues. It will mend the reputation of using dilatory tactics so often and not always for *bona fide* reasons.

The legal fraternity needs to expedite treaty-making processes and compress the preceding negotiations on contentious issues.

The thesis has been vindicated that the law of outer space is loose, nebulous and porous. The faultlines in the law and the grey areas, exposed to divergent interpretations, have been briefly demonstrated. Of course, this list is not comprehensive. An effort has been made to analyse and reveal the shortcomings of the space law, to devise remedies to plug the loopholes, strengthen the text of treaties and fill up chasms so wide and open. But the one point that comes up in sharp relief is that man must realise the impending disasters consequent to his even inadvertent indiscretion. Man must truly appreciate his collective stakes and common responsibility in survival that call for cooperation and not mindless competition. We owe this wisdom to our future generations, lest they fie upon us, perchance of their existence. On a realistic note, it may be stated that international law may not usher mankind into a heaven on earth yet it can surely save humanity from slipping into a veritable hell on earth.

BALLISTIC MISSILE DEFENCE: STRATEGIC ISSUES AND DILEMMAS

ANAND SHARMA

If you have a shield, it is easier to use the sword.
—Richard M. Nixon

In the history of warfare, two major trends can be traced – one is the increasing lethality of weapons and the second is their increasing range. The limit of lethality has been reached with the evolution of nuclear weapons and the limits of range have been reached with the evolution and employment of intercontinental ballistic missiles (ICBMs). Within a decade from its first use during World War II in 1944, the ballistic missile emerged as the most high profile weapon delivery system and became central to strategic stability between the superpowers.

The opulent arms race of nuclear tipped ballistic missiles between the US and USSR manifested in the Cuban missile crisis in 1962. The reality of mutual vulnerability (Mutual Assured Destruction – MAD) was recognised and accepted as the *modus vivendi* for stability in the bipolar world. The period of *détente* between the US and Soviet Union was one of uneasy stability wherein both sides were engaged in developing defensive systems

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against ballistic missiles to gain military advantage and upset the strategic balance in their favour.

Counter-force, by its capability of knocking out almost all the missiles of the adversary before they were even launched, was in effect the prime ballistic missile defence during the Cold War. The counter-force attack envisaged 'first strike' capability. Since the hundred percent destruction of the missile arsenal of the adversary was not achievable, a defensive shield known was sought which could reliably 'mop up' all of the few approaching missiles, those could survive the counter-force 'first strike'. Thus, an 'anti ballistic missile system' (ABM system) was recognised as essential to a credible first strike capability.

Against the backdrop of the nuclear arms race and shifting of the strategic balance from that of a bipolar to a unipolar and then to the multipolar world, the development of defensive systems in the last six decades remain a vexation. The exhorbitant cost of development and the complex technology, which is yet to provide an efficient, full-proof system, is one factor, the other being that, despite being a defensive system, it is profoundly destabilising and strategically aggressive. On the one hand, missile defence signals a choice to resolve a defence dilemma through defensive means, and, on the other, an active defensive system upsets the security balance by providing the capability to attack first and defend against retaliatory strikes. The excitement and hullabaloo about the ballistic missile defence and its effects on arms control, strategic stability worldwide and in the context of regional security dynamics cannot be appraised unless it encompasses the history of missile defence .

The history of missile defence is long and convoluted. Though ABM systems began to surface since the 1950s, systematic development through projects and testing started during the 1960s, when parity of nuclear weapons was the criterion of stability and strategic balance between the superpowers. The arms race further fuelled the urgency to achieve the credible first strike capability through the development of MIRV (multiple independently targetable reentry vehicle), accuracy of warheads through MARV (manoeuvrable advance reentry vehicle) and effective ABM systems to thwart retaliatory strikes. The technological difficulties were enormous and the cost of overcoming them prohibitive.

Notwithstanding, the US missile defence programme continued through the development of the Nike-Zeus/Nike-X/Sentinel and Safeguard system[1]. The Soviets were also pursuing an active defence programme. In 1966, the USSR deployed an ABM system around Moscow consisting of 64 reloadable launchers at four complexes known as the 'Galosh' system[2]. A growing discontent with the concept of mutually assured destruction as a deterrent led to new emphasis on defensive technologies in both the US and the Soviet Union.

The perplexity in the context of deployment of ballistic missile and missile defence systems kicked up a controversy. These active defences sparked intense debate on the viability of ABM systems as the cost of their development as well as of operation was enormous and the effectiveness of the systems was doubtful. Despite phenomenal progress in technology, till date, the viability and effectiveness of ABM systems are the prime issues in the strategic security planning of any country. Will ballistic missile defence (BMD) work? What is the promise of future technology? Will BMD provide the defence an upper hand? Is less than 100 percent defence acceptable? The change in the post Cold War strategic equations has complicated the issue. Space weaponisation is an issue which has further complicated the arms control efforts and strategic balance.

SCOPE

The scope of this paper is to study the strategic issues in the BMD perspective since the Cold War and configuration of the ABM Treaty to resolve the bipolar strategic balance. The rhetoric of "Star Wars" and US initiatives to develop and deploy missile defence systems have been studied. How

1. Safeguard was the first operational US anti-ballistic missile system. A two-tiered system, it consisted of long-range Spartan and short-range Sprint missiles, all nuclear-armed, designed to protect the ICMB silos in North Dakota. Shortly after its 1975 deployment, however, the US Congress cancelled Safeguard due to concerns over its capability and effectiveness.< www.missilethreat.com/missiledefensesystems/id.55/system_detail.asp>
   The A-35 or ABM-1 anti-ballistic missile system was a Soviet military battle management radar complex deployed around Moscow. It featured the nuclear-tipped exo-atmospheric interceptor ABM-1 Galosh. <www.answers.com/topic/a-35-anti-ballistic-missile-system>

2. Sanford Lakoff, *Strategic Defense in the Nuclear Age* (Westport: Praeger Security International, 2007), pp.22-26.

Growing discontent with the concept of MAD led the US to make a determined push to upset the strategic balance in its favour by building an unanswerable first strike nuclear attack capability against the USSR.

did anti-ballistic missile systems become the touchstone for competing strategic, political, technical and moral ideas about the role of nuclear weapons, deterrence and stability? The rationale of the US policy of the "Strategic Defence Initiative" (SDI) leading to the "National Missile Defence" (NMD) which sought the abrogation of the ABM Treaty as a Cold War relic which no longer corroborates strategic stability has been analysed. The worldwide response to the NMD and its implications in the overall strategic context have been addressed.

ABM SYSTEMS AND STRATEGIC ISSUES DURING THE COLD WAR

The US and USSR were testing elements of the ABM system based on long range interceptor missiles armed with nuclear warheads and directed by an elaborate radar network. Soviet systems were validated as successful but the Soviet programme mostly remained shrouded in secrecy and inaccessible.

Growing discontent with the concept of MAD led the US to make a determined push to upset the strategic balance in its favour by building an unanswerable first strike nuclear attack capability against the USSR. This has been the US policy till date. The fact was also appreciated that the first strike will never achieve 100 percent destruction of the Soviet nuclear weapons and ballistic missiles. Therefore, a defensive shield to protect the US from those few Soviet missiles that would have survived the first strike was thought of as an essential requirement, as a component of US first strike capability. It was argued that such a defensive shield will make the threat of first strike credible, because a ballistic missile defensive system will evidently be more effective against a weakened counter-attack than against a first strike. The ABM system, therefore, provided a rationale to attack first, thus, complicating the stability paradigm by adding to the uncertainties of a first strike.[3]

3. Lakoff, Ibid.

The efforts of fielding an ABM system during the 1960s could not progress due to the following reasons:

- Reliance on nuclear warheads for ballistic missiles interception. The electromagnetic pulse (EMP) caused by explosions of interceptor warheads would be detrimental to the defender's own ABM radar network, satellites, and interfere with national communication and electronic systems.[4] Exploding own nuclear warheads over one's own territory could make the solution as bad as the problem it addressed.
- The radar systems are required to be powerful, sophisticated and network enabled for real-time data communication between sensors and shooters through an effective command and control structure. This was a difficult proposition with the technology of the 1960s[5].
- Relatively simple counter-measures could render the ABM system ineffective.
- The ABM system was not capable of defending against saturation strikes comprising a large number of missiles. The task of hitting an incoming warhead was complicated because of the possible use of MIRVs in which an ICBM carries several RVs that can hit widely spread targets, confounding and possibly saturating the defence.
- Deployment of a widespread ABM system would have put the adversary into a *de facto* posture of massive retaliation. It offered a rationale to adopt the 'strike first' policy, as defending from counter-strike is a relatively easier proposition. The ABM system, thus, introduced ambiguity in strategic calculations.
- ABM systems were exorbitantly costly to develop and operate, given the advantage they offered with the then existing technologies.

4. "Nuclear Weapon EMP Effects" < www.fas.org/nuke/intro/nuke/emp.htm.>
5. The radars required for the anti-ballistic missile systems were 100 times larger than existing surface-to-air missile radars, and generated 10 million times more energy. They required encrypted communications lines between the radar and the guidance system computers. The computers themselves had to be capable of 40,000 operations per second. <http://www.astronautix.com/lvs/v1000.htm>

ABM TREATY

By the late Sixties, the technological challenges, operational difficulties and exorbitant cost of ABM defence systems had led to a bitter debate that continues to this day. Advocates of ABM defence admitted that it was not technically possible to build a leak-proof defence against the strikes of hundreds of ICBMs, but maintained that even a partial defence could save tens of millions of lives and would complicate the plans of any adversary scheming to perform a nuclear 'first strike'.

Conversely, critics argued that given the technical challenges, massive expense and effectiveness of simple counter-measures, it was not a viable system. They also felt that the ABM system might actually disrupt the balance of power.

By the early Seventies, during the period of *détente*, both the superpowers focussed attention on arms control treaties as a means of scaling back the arms race and preserving the basis of nuclear deterrence. The two superpowers basically agreed that the technology of the time was inadequate to create an operable ABM system and also the limitation of ABM systems was essential for agreements on reduction on strategic nuclear weapon levels.[6] MAD had become the focal point of efforts for strategic stability which drove the US and USSR to the Strategic Arms Limitation Treaty (SALT) to establish limits on strategic offensive weapons such as ICBMs and to impose restrictions on the development of ballistic missile defence systems through ABM Treaty[7] signed in 1972. The United States and the Soviet Union negotiated the ABM Treaty as part of an effort to control their offensive arms race.

The two sides reasoned that limiting defensive systems would reduce the need to build more or new offensive weapons to overcome any defence that the other might deploy. Without effective nationwide defences, each superpower

6. Bhupendra Jasani, *Space Weapons and International Security* (SIPRI, Oxford University Press, 1987), pp.3-6.

7. "The Anti-Ballistic Missile (ABM) Treaty at a Glance" < www.armscontrol.org/factsheets/abmtreaty.asp > "The ABM Treaty and Ballistic Missile Defense" < www.fas.org/spp/eprint/cfr_nc_4.htm>

remained vulnerable, even with reduced offensive force holdings of nuclear weapons, deterring either side from launching an attack first because it faced a potential retaliatory strike that would assure its own destruction. The ABM Treaty was hailed as a cornerstone effort towards bipolar stability and worked as an enabler to the policy of MAD.

Neither side was allowed to develop a nationwide missile defence system, although they were permitted to develop two ABM areas: one around the capital city and another around an ICBM launch site. This was later reduced to one deployment site with an upper ceiling of 100 launchers and 100 anti-ballistic missiles.[8] However, research and development (R&D) of the ABM system continued in a quiet fashion at lower budget levels through the late 1970s. The focus of defence development programmes was on 'hit to kill' (HTK) technology because, by then, it became feasible to accurately guide the interceptor missile to the incoming RV and ram it, without even carrying a nuclear or conventional warhead.

Strategic Defence Initiative

By 1982, the political climate began to shift away from the comfortable notion that nations were better off keeping themselves exposed and defenceless while relying on offensive weapons to balance the deterrence. With the Soviet invasion of Afghanistan in December 1979, the superpower relations began to deteriorate once again. The high hopes of arms control were at best a mixed bag and attention turned towards the strategic balance of power. Soviet arms control violations were also brought to notice which were significant and elicited the US decision for missile defence.

President Reagan refused to accept the notion that vulnerability to attack represented a superior moral and strategic position. He raised serious questions about stability through MAD and was against the arrangement of stability by holding US populations and cities hostage to an ever growing number of Soviet missiles. The Soviet Union carried through its substantial improvement programme in 1980 for its Moscow

8. http://www.state.gov/www/global/arms/treaties/abm/abm2.html

BMD system to overcome vulnerabilities and increase its capabilities to respond, alarmed the US. This expanded Moscow system involved two layers instead of one layer of defence and radars which were deployed on the borders of the USSR. The new system known as ABM-X-3 had an advanced phased array engagement radar and a high acceleration interceptor missile.[9] The technological improvements in the Soviet Union contributed to the US motivation to introduce the SDI.

In March 1983, Ronald Reagan announced his decision to launch a major new R&D programme to see if it might be feasible to deploy effective missile defences at some point in the future. This marked the point of departure for the basis of the US strategic policy away from the threat of retaliation and toward protecting the American people and territory against attack. Based upon the technical recommendations, President Reagan established the Strategic Defence Initiative Organisation (SDIO). With the SDI, defence against ballistic missiles changed from a marginal role since the conclusion of the ABM Treaty to a major national goal. As a focussed research and technology development programme of the highest priority, SDIO was given the mission to pursue various technological paths leading to a viable, comprehensive BMD system. The promising technologies were high power conventional lasers, particle beam weapons, orbiting X-ray lasers and orbiting constellation of small satellites carrying HTK interceptors[10], known as "Brilliant Pebbles"[11]. This again sparked an intense debate and denunciation by idealistic arms control and peace groups, political, regional and scientific communities. Nonetheless, the missile defence became a visible issue, out of the closet.

9. Mira Duric, *The Strategic Defence Initiative* (Ashgate Publishing Ltd., 2003), pp8-15.

10. HTK interceptors: Systems that rely on collision with the incoming weapon are called "hit to kill". These systems use the motion and mass of a kill vehicle to strike an incoming weapon. The hit-to-kill or kinetic energy technology approach is based on the fact that when one object strikes another object at high speeds, a tremendous amount of destructive energy is released. The impact of an interceptor missile with an incoming tactical ballistic missile, aircraft, or cruise missile, can result in the total disintegration of both vehicles. Such impact can literally vaporise even metals.

11. Brilliant Pebbles, the top anti-missile programme of the Reagan Administration, was an attempt to deploy a 4,000-satellite constellation in low-earth orbit that would fire high-velocity, watermelon-sized projectiles at long-range ballistic missiles launched from anywhere in the world.

Reagan's aversion to nuclear weapons, even if they were to be used defensively, was one of the reasons behind the establishment of SDI. Reagan counted on American technical superiority in the elements needed for development of the missile defence system. He believed that the Soviets would opt for a negotiated reduction of nuclear weapons and that would not only lessen the danger of nuclear war but also set back the global expansion of Communism.[12] In 1985, SDIO released the architecture of a defensive system describing a possible configuration.

President Reagan refused to accept the notion that vulnerability to attack represented a superior moral and strategic position.

This architecture suggested defensive layers, including air, land, sea and space-based components to track and shoot down incoming missiles during the boost, cruise and descent phases of a ballistic missile's flight. Hundreds of satellites were proposed for command and control, communication, remote sensing, battle management and interception. However, simple counter-measures could negate these defences. This weakness evoked serious debate against ABM efforts because, if even one percent of nuclear warheads escaped the defence shield, the outcome would be devastating. The technical side of the SDI debate, thus, proved weak because providing better than 99 percent defensive coverage was not achievable.

SDI became a subject of controversy among political leaders and allies. Whether a defensive system based on the use of space weapons will technically achieve defence for the whole population was debated and also it was argued that such a system will, no doubt, destabilise international relations. Contrary to the US argument that nuclear weapon will become obsolete when such a defensive shield is available, it was contended that there may be an increase in offensive weapons in order to saturate the defences of the opponent, at least during the phase when only one side has acquired the capability to defend against ICBMs. Concerns over the 1972 Anti-Ballistic Missile Treaty, the possible destabilisation effects of SDI, and its enormous cost became major issues.

12. Lakoff, n. 2, p.35.

The Soviet Union saw SDI as an American effort to "militarise space" and persistently refused to accept it as a defensive system.

The Soviet Union saw SDI as an American effort to militarise space and persistently refused to accept it as a defensive system. The USSR observed it as a system which would improve surveillance communication through space, which would improve the targeting of offensive weapons. They observed that SDI would provide anti-satellite weapons (ASATs) and even allow for placing of weapons in orbits. All the arms reduction talks between Gorbachev and Reagan remained in an impasse, with SDI as the stumbling block, which Reagan was not willing to bargain. However, the Soviets agreed to break the linkage between arms reduction agreements and SDI and the way was cleared for the Intermediate Nuclear Forces (INF) Treaty which was signed in 1987.

The North Atlantic Treaty Organisation's(NATO's) discomfort with SDI was that NATO's security planning had been premised on the belief that nuclear weapons were the single most important element in the strategy of deterrence and defence spending was designed accordingly. Reagan's call for a "defence transition" which would presumably make the nuclear weapons impotent and obsolete was seen as a complete reversal of the strategic consensus adopted by NATO. This call could make their military hardware, acquired at great expense, obsolete and their efforts towards a policy of "flexible response"[13] go to waste. Their biggest fear was that it would decouple

13. Flexible Response: When President Kennedy took office in 1961, he modified Eisenhower's policy of Massive Retaliation and adopted a stance of Flexible Response. This policy included the use of conventional forces in war and offered alternatives to total nuclear war. The alternatives consisted of an increase in conventional weapons systems and introduced the concept of limited nuclear war. Both President Kennedy and his successor, Lyndon Johnson, determined that effective military power meant stronger conventional military forces and nuclear options short of global nuclear war. Flexible Response marked a shift away from the previous policy of Massive Retaliation. While Kennedy believed nuclear deterrence remained paramount, he also understood that limited wars and low intensity conflicts should be fought with conventional weapons.

American and European security. To allay European concerns, the US stressed that SDI would be designed for the defence of Europe as well as the US.

During the 1980s, some 350 Scud ballistic missiles had been employed by Iran and Iraq in their "war of the cities."

The ABM Treaty prohibited development, testing, or deployment of ABM systems or components whether sea-based, air-based, space-based, or mobile land-based. It was, however, through the broadest interpretation of this treaty, which permitted research and experimental work prior to development that the US chose to define "development" as a phase which began with field testing of full scale ABM systems and components. In essence, this broad interpretation permitted development and testing, but not deployment. Dubbed as "Star Wars", SDI remained an R&D effort for missile defence but the vision of President Reagan's missile defence lived on beyond the Cold War.

POST-COLD WAR RESURGENCE OF MISSILE DEFENCE

The Berlin Wall came down and with the demise of the Soviet Union, a new post-Cold War era was dawning. With the dissolution of the Warsaw Pact, and the collapse of the Soviet Union, Armageddon-like strikes were no longer relevant. During the 1980s, many Third World countries assigned a high priority to the acquisition of ballistic missiles. The waning of direct threats to US national security from the Soviet Union and the rise of more general threats to international stability that are nevertheless inimical to US interests over the long term, required a well thought out strategic response. The stark consequences of ballistic missile proliferation in the developing world were seen by millions of people around the world. Indeed, during the 1980s, some 350 Scud ballistic missiles had been employed by Iran and Iraq in their "war of the cities".

The employability of ballistic missile in war-fighting was demonstrated in the 1991 Gulf War and was decisive in bringing missile defence to the

forefront once again. Saddam Hussein launched over 68 Scud missile attacks against US forces and targets in Saudi Arabia and Israel.[14]

The lessons from the Gulf War have been crucial for the resurgence of missile defence.

- First, reliance only on deterrence through the threat of retaliation will not prevent unstable dictators or terrorist nations from acquiring and using ballistic missiles.
- Second, it is unlikely that preemptive strikes could destroy all launchers before their missiles are launched.
- Third, the Patriots, irrespective of their limited success, demonstrated that it is possible to intercept ballistic missiles in flight.
- Fourth, defences need not work perfectly to be useful.
- Fifth, defences that cost more than the attacking weapons can be well worth the price— just ask the citizens of Tel Aviv and Riyadh.

The collapse of the former Soviet Union and the Gulf War provide compelling evidence that defence against ballistic missile attack is more imperative than ever. Thus, the focus altered to consider how to defend against limited strikes from anywhere in the world.

***Global Protection Against Limited Strike* (GPALS)**

The Gulf War, 1991, shifted the perception from the strategic to the theatre ballistic missile threat. With ballistic missiles and weapons of mass destruction (WMD) proliferation in the developing world, SDIO was reorganised into the Ballistic Missile Defence Organisation (BMDO). The refocussed programme, which sought to increase SDI's emphasis on theatre missile defence, was called "Global Protection Against Limited Strikes" (GPALS).

14. On January 17, Iraq launched its first Scud missile. The Scuds had limited range and accuracy but were useful weapons of terror. Coalition intelligence had underestimated their numbers and failed to account for them in the war plans. Hussein was using them to break the Coalition. By firing them at Israel, he hoped to draw that country into the war, knowing the Arab nations would not fight alongside Israel. And he fired them at Saudi Arabia to try to convince it that it was too risky to host the Coalition. <www.centennialofflight.gov/essay/Air_Power/gulf_war/AP44.htm>

Under the GPALS programme, the objective was to protect the US forces deployed overseas as well as allies, by destroying the warheads of limited ballistic missile strikes (up to 200 warheads) launched from anywhere on earth. GPALS envisaged three elements of defence, working in concert to provide the best possible protection against limited ballistic missile attacks.

Iraq's firing of Scuds and no clear evidence of successful intercepts by Patriots became a serious embarrassment for the SDIO and a setback for the GPALS programme.

- First, it would consist of stand- alone defences against theatre or tactical ballistic missiles, to be located in battle areas or at sea.
- Second, it would be a ground- based system of some 750 interceptors to be deployed at about six sites in the US.
- Third, a space- based tier consisting entirely of about 1,000 "Brilliant Pebbles". The emphasis and priority would be to develop theatre defences to protect US forces against cud type missiles, as gleaned from the Gulf War.[15]

"Brilliant Pebbles" became the centrepiece to the overall architecture, with each small space-based interceptor stationed between 800 to 1,600 km apart in orbit, with the ability to defend against up to 200 warheads. The constellation of Pebbles would also defend against limited strikes of single warhead tipped missiles. However, the research and development of this programme exceeded the limits of the ABM Treaty. Negotiations were held with the Russian government for a more cooperative and flexible arms control regime than the ABM Treaty.

Iraq's firing of Scuds and no clear evidence of successful intercept by Patriots became a serious embarrassment for the SDIO and a setback for the GPALS programme. President Clinton reduced the SDI programme to R&D levels with reduced budgeting in 1993 which slowly denoted the end of the "Star War" era.

15. <http://www.globalsecurity.org/space/systems/gpals.htm>

National Missile Defence **(NMD)**

Proliferation of missile technology and nuclear weapon technology in the developing world became rampant and the concerns of policy-makers and experts of geo-politics grew on account of the exposure of vulnerabilities. Various reports resurfaced advocating development and deployment of missile defence. Many countries, mainly China, Iran and North Korea amongst them, were developing missile technology especially the long range one, and the term "proliferation" emerged as one of the most contentious issues in the geo-strategic balance of power.

The Rumsfeld Commission's[16] findings in 1998 provided that the world-wide proliferation of weapons of mass destruction and their delivery vehicles posed a growing threat even to the continental US. The commission report gave a sort of warning of a "Nuclear Pearl Harbour" with more and more developing nations acquiring ballistic missiles and WMD, and their regional ambitions not welcoming a US role in their region. The Clinton Administration could not ignore the North Korean development and testing of long range missiles and WMD. In July 1999, the US formulated the National Missile Defence Act to deploy as soon as possible an effective NMD system against limited ballistic missile attacks, whether accidental, unauthorised or deliberate. Clinton's plan differed substantially from Bush's as it was based on continued adherence to the ABM Treaty in its narrow interpretation. It called for 20 ground-based missiles, ignored Brilliant Pebbles and did not put high priority on the possible eventual development of a more robust defence of the entire nation.

The testing and deployment of an NMD system envisaged significant amendments to the ABM Treaty. The Russians agreed to permit modernisation of theatre missiles previously limited by the ABM Treaty and with this joint agreement,[17] the US could improve its THAAD (theatre high altitude area defence) missile up to a velocity of five kilometres

16. Report of the Commission to Assess the Ballistic Missile Threat to the United States, July 15, 1998 <http://www.fas.org.>

17. "Ballistic Missile Defence", Research Paper 03/28, March 2003,<www.parliament.uk/commons/lib/research/rp2003>

per second so long it is tested against a missile below the speed of an ICBM. This was an important agreement as during reentry, an incoming warhead could be intercepted by an upgraded THAAD.

Further US efforts to amend the ABM Treaty to allow even a limited national defence were not agreed to by Russia. Nevertheless, the Ballistic Missile Defence Organisation (BMDO) was given a revived mandate to develop limited ground-based defence and its deployment was held in abeyance depending on assessment of threat.

The 21st century threats as recognised by the Bush Administration called for the move beyond the constraints of the ABM Treaty to tackle emerging threats.

The 21st century threats as recognised by the Bush Administration called for the move beyond the constraints of the ABM Treaty to tackle emerging threats and to stem the proliferation of WMD. After the events of September 11, the Bush Administration gave a further push to the missile defence programme. The major concern of the US is not a heavily armed state or superpower rival but the capabilities that small and medium powers/ non-state actors might acquire in the near future. These suppositional threats are the reasons forwarded by the US to abrogate the ABM Treaty and pursue development and deployment of missile defences. On December 13, 2001, the US formally approached Russia about its intention to withdraw from the ABM Treaty in six months. The US withdrew in June 2002 from the ABM Treaty. In December 2002, US President George W. Bush directed the US Department of Defence to begin fielding limited missile defence capabilities. BMDO was renamed as the Missile Defence Agency (MDA). The Administration has also eliminated the distinction between "national" and "theatre" missile defences. By late 2004, MDA fielded a system at Ft. Greely, Alaska, and another two at Vandenberg Air Force Base, California, to provide a limited defence capability to intercept and destroy a ballistic missile launched from North Korea or Iran.

The USA is developing multiple systems for each of the three phases (boost phase, mid-course phase and reentry phase) and plans to integrate them altogether into one overall 'system of systems'. So it is important to understand that this is not just one system or a new weapon like a new submarine or a new jet fighter, it is a vast, integrated, cutting edge network of weapon systems that are being developed simultaneously, some in partnership with other countries. The United States is developing a multi-layered missile defence system. In order to counter tactical ballistic and cruise missiles, the US Patriot Advanced Capability (PAC-3) missile[18] mounted on a mobile platform, has already been in operation and has been utilised in the battlefield. The sea-based Aegis system[19] and THAAD[20] are designed to provide defence against medium range missiles. The shield against short and medium range missiles usually covers specific objectives and limited areas (or theatres) and is, therefore, referred to as theatre missile defence (TMD)[21]. Interceptors of the missile defence shield against long range missiles (known as ground-based mid-course defence – GBMD)

18. Patriot Advanced Capability (PAC-3) missile, through the use of advanced hit-to-kill technology enables target destruction, i.e. tactical ballistic and cruise missiles. The missile was first deployed during Operation Iraqi Freedom in March/April 2003.

19. Aegis Ballistic Missile Defence is the sea-based element of the Missile Defence Agency's ballistic Missile Defence System that has been tactically certified, deployed and contributes to the ongoing BMD system under development. Aegis Ballistic Missile Defence leverages and builds upon capabilities inherent in the Aegis Weapon System, Standard Missile, and Navy Ballistic Missile Command, Control, Communications, Computers, and Intelligence systems.

20. Terminal High Altitude Area Defence (THAAD), formerly Theatre High Altitude Area Defence, is a United States Army project to develop a system to shoot down short- and medium-range ballistic missiles over a theatre or region by ramming them with interceptor missiles. THAAD missiles have an estimated range of 125 miles (200 km), and can reach an altitude of 93 miles (150 km). The upper-tier THAAD addresses critical requirements to intercept longer-range theater-class ballistic missiles at high altitudes.

21. TMD systems defend territory or military forces by tracking incoming ballistic missiles with radar and launching interceptor missiles to destroy them. TMD systems can be ground-based, sea-based, or air-based and can use information about incoming missiles gathered by surveillance satellites to increase their effectiveness. Lower-tier systems such as the Patriot PAC-3 system defend a relatively small area (or footprint) against shorter-range missiles (up to 1000 km). Upper-tier systems such as the Navy Theatre Wide (NTW) system intercept incoming ballistic missiles at a higher altitude and can therefore defend a larger area against longer-range missiles (up to 4,000-5,000 km). TMD systems use some of the same technology as NMD, but are unable to intercept very-long range intercontinental ballistic missiles (ICBMs).

are installed at Alaska and California, intended to defend against missile launch from North Korea. Negotiations for a 'third site' in Central Europe are underway for catering to long range missile attacks from the Middle East, notably Iran. In Central Europe, the radar site is proposed in the Czech Republic and ten ground-based interceptors deployment in Poland has been negotiated. The boost phase intercept systems being researched and under development are, firstly, the US Air Force's airborne laser (ABL) which is converting the Boeing 747 for oxygen iodine chemical lasers to shoot down missiles in their ascent phase; secondly, using unmanned aerial vehicles (UAVs) to launch high speed interceptors (Global Hawk); thirdly, space-based laser through constellation of satellites each carrying a hydrogen-fluoride chemical laser and onboard sensing and surveillance equipment; and, fourthly, forward deployment of the Aegis system as a possible sea-based boost phase interception system.

The important point is that the US missile defence programme is open-ended; it has no set end point.[22] The development and deployment of these systems is evolutionary; as and when new technologies are researched and new ideas come to fruition, they will be developed and deployed, integrated into the network and improved.

RESPONSE TO US WITHDRAWAL FROM ABM TREATY AND NMD

Though the ABM Treaty was bilateral, US withdrawal from it posed various strategic issues worldwide. Russia, China, and the NATO-European countries raised serious questions about a future arms race involving other countries worldwide. The Bush Administration made it clear that it considered the treaty a Cold War relic and wanted to scrap it in order to proceed with testing for a new missile defence shield. The United States was sceptical about the nuclear deterrent posture being able to dissuade states from developing missile technology and deter attacks from those who do. Russian leaders condemned this unilateral approach and issued dire warnings of the

22. "National Policy on Ballistic Missile Defense Fact Sheet" < http://www.whitehouse.gov/news/releases/2003/05>

The case for abrogation of the ABM Treaty and deployment of missile defence as put forward by the Bush Administration was contentious and debatable.

detriment the American decision would cause to global strategic security. Russian legislators condemned the US withdrawal from the ABM Treaty and strongly criticised it as "a serious political mistake".

In the post-Cold War strategic situation, both Russia and China see the prime threat to their security stemming from the United States, whereas the United States sees the primary near term threat as missile proliferation in countries of concern and from non-state actors, aided and abetted by these countries of concern. The UK and France focus on residual threats from Russia and long-term threats from WMD proliferators, neither of which are immediate or pressing. In addition, the relationship among nuclear weapon states (NWS) has also changed. What was a core bilateral relationship is now variously described as a unilateral, trilateral or multilateral relationship. Hence, concerns of the US that threats from states possessing limited WMD and missile capabilities would not be deterred by the threat of annihilating retribution are not shared elsewhere. This disjuncture underlies the international debate and friction over missile defence and missile proliferation.[23]

The case for abrogation of the ABM Treaty and deployment of missile defence as put forward by the Bush Administration was contentious and debatable. US projection of its threat perception is that it is not from a heavily armed superpower but from the offensive capabilities of those smaller states that might acquire these missiles at some unknown point in the future.[24] Further, in a hypothetical case of emergence of a new threat, missile defence could not be the obvious choice as it was still not proven to be hundred percent effective and take on saturation strikes of hundreds of missile

23. Tomas Valasek, "Europe's Missile Defense Options", *The Defense Monitor*, vol. 30, no 3, March3, 2001< www.cdi.org>

24. Gary Brown and Dr Gary Klintworth, "The US National Missile Defense Program: Vital Shield or Modern-Day Maginot Line", December, 2000, Research Paper 16 <http://www.aph.gov.au/library/pubs/rp/2000-01/01RP16.htm>

attacks in a theatre or to the continental US. It is debatable that till date nuclear deterrence and retribution has been the trusted US tool against the USSR and China and now it is mysterious as to how the US is challenged by such smaller and weaker opponents against whom US nuclear deterrence is estimated to be of no value. The logic of denigration of deterrence is arguably flawed, as even today, till the time the leak-proof full-fledged NMD is deployed, deterrence is still the only tool available.

The more ambitious the goal of defence becomes, the higher and further out the intercepting weapon's reach, the more the ambiguity arises.

The US view that failure to deploy missile defences provides incentives for missile proliferation has been dismissed by geo-political strategists worldwide as deployment of missile defence would evoke an offence-defence arms race. The more ambitious the goal of defence becomes, the higher and further out the intercepting weapon's reach, the more the ambiguity arises.

- First, the interceptors cannot reliably be discriminated from other offensive ballistic missiles and, thus, create threat perceptions which will lead to increased arms build- up.
- Second, an accidental or unintentional launch of an interceptor or an object erroneously entering one's air space, could spell crossing the threshold from crisis to war. With the unavailability of time, political control is impossible.
- Third, any interceptor for exo-atmospheric interception of ballistic missiles is inherently suited to destroy satellites in low earth orbits, thus, complicating the issue as misunderstandings or unclear events could lead to war.
- Fourth, it is important to note that once a ballistic missile launch is detected, its launchers and storage site can be traced to pin- point accuracy and because of the limited efficiency of anti- ballistic missile defences, it is likely that they will be supplemented by offensive strikes at the launchers before the second or even first missile is launched (possible through real-

time intelligence, surveillance, reconnaissance—ISR) leading to a crisis situation of offence-defence.

- Fifth, the adversarial states may take a variety of measures that might negate defences such as development of MIRV, MARV or decoys. Cheaper and complicating methods of delivery of nuclear weapons through cruise missiles or UAVs pose greater problems for the NMD.

Implications for Russia

The US argument to amend the ABM Treaty towards a flexible approach for development and deployment of tactical TMD and THAAD has been agreed to by Russia. But Russia declined any further amendment to the treaty for the development of a nationwide missile defence system.[25] This Russian stance provides that the modest development of TMD against so-called "irresponsible states" having a limited nuclear force, would not jeopardise its large nuclear force, however, NMD may prove dangerous as actual US plans were not known. Russia does not see any threat from smaller Middle Eastern states that possess very limited capability and believes that these states would not take the risk of attacking US nuclear forces, which would be suicidal.

Missile defence is likely to be even more important, supporting preeminence in space.

This type of scenario represents a 'high consequence but low probability' threat and, hence, Russia feels that the US rhetoric of such expensive development and deployment to cater for such a low probability threat is not the compelling reason. The US rebuttal that these systems are not aimed at achieving global hegemony has not been received well by Russia and China, especially when the ultimate aim could be to achieve outer space control. The implications of NMD deployment that relies on space-based components may open a Pandora's Box. With today's enabling technologies, it is hard to imagine a world without space-based capabilities supporting

25. Nikolai Sokov, "US Withdrawal from the ABM Treaty: Post-Mortem and Possible Consequences" < http://cns.miis.edu/>

soldiers, sailors, airmen and marines along the civil uses of space. Missile defence is likely to be even more important, supporting preeminence in space. Rebuffing the Outer Space Treaty for NMD deployment will have far-reaching consequences.

The initial response from the Russian Federation on the United States' secession from the ABM Treaty was restrained. It may be due to the fact that Russia's strategic readiness was undermined by financial and social pressures. However, Russia under Vladimir Putin has come out of its economic crisis and could once again rearm and rebuild. Russian military expenditure that was US$ 33 billion in 1988, plummeted to US $ 9 billion in 1998. This has since then been rising and in 2008, stood at US $ 70 billion[26]. Awash with energy generated cash, Russia could once again flex its muscle.

The continuing eastward expansion of NATO, especially losing some of its former Warsaw Pact allies to the West is a vexing issue for Russia. It feels encircled and threatened politically and militarily. NATO's war on Yugoslavia jolted Russia. Russia views the NMD programme as a real threat to its nuclear deterrent forces and to its national security. The following are the reasons of distrust:

- Russia sees no threat from Iran and WMD terrorism which necessitates such defences[27]. The US has declared that its calculation is not based on an assessment of threats to its national security but on an assessment of the capabilities of other nations to harm its national security. Being the only country that possesses such potential, Russia is sceptical about US plans of destroying its nuclear delivery vehicles.
- Russia is concerned about siting of the missile shield in Europe i.e. Poland and Czech Republic (both of them former Warsaw Pact countries). The radar to be deployed in the Czech Republic would be used to monitor or

26. "World Military Spending" <http://www.globalissues.org/article/75/world-military-spending>

27. Manpreet Sethi, "Current Trends in Nuclear Weapons Thinking and Strategies", in Jasjit Singh, ed., *Asian Defence Review 2007* (New Delhi: Knowledge World Publishers, 2007), Ch. 3, pp. 67-78.

spy on Russia. The US has not guaranteed that the siting of the radar and interceptors in the Czech Republic and Poland is limited to a single radar and only 10 interceptors and this will not be augmented with more radars and interceptors at different bases in Europe and also that they will not be equipped with boost phase interception capabilities.

- Russia is of the opinion that the US move to deploy a missile shield in Eastern Europe will trigger a new arms race. It is concerned that missile defence would lead to placement of weapons in outer space.
- Russia feels that NMD is only a stage, a first step towards the future emergence of a multifunctional global system for combating all types of missiles, aerodynamic and space targets and also surface targets.

Russian Response and Possible Developments

During 1990, Russia was in no condition to compete with the US and would have readied itself to concede global leadership to the US, and, thus, the response on US abrogation of the ABM Treaty was muted. Although Russia pointed out the problems of missile defence, undermining the strategic stability, it was not interested is being dragged into another arms race. But the US' ambitious desire of being the sole global power and its imperialistic approach hurt Russia many a times. The issues of missile defence and the Kosovo problem proved to be the Rubicon of East-West relations. The West demonstratively ignored Russia's position, and this was bound to evoke a response. So, the contradictions that have been building up between Russia and the United States since the late 1990s, emerged with the conflict in Georgia. Now, we are to witness the start of a new spiral in history— once again, a history of confrontation between two superpowers, each trying to build the world according to its interests.

Russia's influence in Eastern Europe is at stake and it is not prepared to renounce its position as it did in the 1990s. With Russia's consolidation, buoyed by a favourable economic situation and political stabilisation, it will try to regain its spheres of influence, at least in the post-Soviet space and Eastern Europe. The West may be indignant, but it will have to face reality

and there are political, as well as financial interests that would be damaged by a confrontation with Russia which would be too expensive to risk.

The effectiveness of a missile defence system is inversely proportional to the number of attacking missiles against it.

The cooperation in the global war on terror is growing now and cooperation in arms reduction and control has become secondary. It is obvious that Russia will equip its Topol-M missiles with multiple manoeuvrable warheads.[28] It may also arm various deployments with MIRVed missiles. Russia has already withdrawn from the Conventional Forces in Europe (CFE) Treaty in November 2007, and may also give up its unilateral commitments to reduce tactical nuclear weapons, separate warheads or redeploy in the middle of the country. Russia has hinted at positioning its ballistic missiles at the Baltic enclave of the Kaliningrad region and the short range nuclear capable missiles like the Iskender missile in Belarus.

The Strategic Arms Reduction Treaty-1 (START-1 Treaty) between the US and Russia will expire in 2009. The reduction of strategic offensive weapons will enhance the role of missile defence systems. The effectiveness of a missile defence system is inversely proportional to the number of attacking missiles against it. Therefore, it is rational to assume that Russia may keep the effective deterrent against the US missile defence shield and be assured that its retaliatory response would bring unacceptable damage to the enemy[29]. Russia has been hinting at withdrawal from the INF Treaty and has been laying the groundwork for withdrawal by characterising the emplacement of the US GBMD installations in Europe as a reason which is detrimental to its security planning. Having withdrawn from the INF Treaty, Russia would be free to once again begin construction of intermediate-range ballistic missiles (IRBMs) as a means of levelling the playing field. A barrage of several dozen

28. Martin Sieff," Russia Boosts Topol ICBM to beat US Defenses" < http://www.upi.com/Security_Industry/2008/09/03>

29. Yuri Zaitsev, " Russia May Put Nukes on Missiles in Kaliningrad" < http://www.upi.com/Security_Industry/2008/09/03>

IRBMs could easily overwhelm a small squadron of BMD interceptors based in Europe as well as any system that the United States may conceivably field in the next 20 years. This is not an option that would buy Russia parity with the United States, nevertheless, Russia could use a new IRBM force to threaten Europe and resurrect a host of diplomatic options that served the Kremlin interests very well in the past.[30]

In a symbolic move, two Tupolev Tu-160 nuclear bombers which were sent to Venezuela on September 10, 2008, carried out a six-hour patrol over the Caribbean Sea. If Russia permanently deploys its Tu-160s in Venezuela, the United States could be at greater risk than at any time since the darkest days of the Cold War.

The Mach-2, super-long-range Tu-160s can carry standoff X-555 cruise missiles with a range of 2,000 miles. That means that from a base in Venezuela, they could 'loiter' over the Caribbean for 10 or more hours at a time, with a capability of firing their Mach 2.8 cruise missiles that are capable of flying at sea level and hugging ground contours so their exact flight path cannot be intercepted in advance and with a range that can hit almost any target in the entire United States.

Since the end of the Cold War, the United States has let virtually all its domestic defences against manned bomber attacks vanish. The Blackjacks would fly well "under the umbrella" of even the 'PAC-3' and US Navy's Standard Missile-3 anti-ballistic missiles systems, none of which are designed for manned aircraft interception. The cold fact is that the United States currently has no missile defence system capable of knocking down a Blackjack missile attack except combat aircraft.[31]

With this return to the Cold War situation of a direct confrontation between US and Russia, with a substantial nuclear arsenal, the old inviolable logic of mutual assured destruction reasserts itself.

30. Nathan Hughes and Peter Zeihan, "The INF Treaty: Implications of a Russian Withdrawal", Stratfor, February 2007 <http://www.stratfor.com/inf_treaty_implications_russian_withdrawal>

31. Martin Sieff, "BMD Focus: US Vulnerable to Tu-160s" (UPI- September 17, 2008) < http://www.spacewar.com/reports>

European Perspective

The initial European response to the US withdrawal from the ABM Treaty was sceptical. For European states, the fact that Iran and Syria are developing ICBMs does not automatically represent critical danger and they were not forthcoming to define these Middle Eastern developing missile capabilities as threats beyond political (economical) amelioration. European analysts noted that the intense US concern about the potential for nuclear missile attack is at odds with NATO's current strategic doctrine, which states that the threat from nuclear weapons is extremely remote.[32]

Led by France and Germany, many European allies expressed concerns that the proposed NMD would damage relations with Russia, endanger arms control and decouple US and European security. They argued that Russia will identify the European Union (EU) as a US led strategic bloc and, thus, become suspicious of its intention, with a possible negative fallout on the European economy and energy needs. The logical consequence would be that the United States' European partners would become more attractive as targets for those who oppose US actions. During the foreign ministers meeting in December 1999, the US laboured the case, allaying the fears of NATO towards security and proliferation of nuclear weapons and missiles. Despite strong US campaigning, NATO countries remained muted as no one displayed enthusiasm or was absolutely critical, with the exception of France, whose President, Jacques Chirac, has been outspoken in his criticism of the US NMD plans.[33]

However, the EU's disunity on crucial strategic issues such as the Iraq War, Turkey's accession and energy policy pushed the US towards bilateral agreements on NMD issues. Negotiations between the US-Poland and US - Czech Republic on the deployment of elements of the US GBMD have been conducted strictly bilaterally and not in NATO's context. Nevertheless, the US has finally achieved its long-term goal of setting up a BMD system in

32. Steven A. Hildreth and Carl Ek, "Long-Range Ballistic Missile Defense in Europe", CRS Report, July 2008< http://www.fas.org/sgp/crs/weapons/RL34051.pdf>

33. Wade Boese, "NATO Ministers Skeptical of US NMD Plans", December 1999 < http://www.armscontrol.org/act/1999>

BMD technology has advanced considerably and is now far more likely to work.

Europe. Europe will end up having missile defence facilities installed on its territory but without being in control of them.

For the Central European states, the benefits of such deals are obvious. Most of these states fear a future conflict with Russia, and anything they can do to solidify a military arrangement with Washington is, to their thinking, a benefit in and of itself. But even in Western Europe, further removed from the Russian periphery, opposition to the United States' BMD programmes seems to have relaxed considerably. There are several reasons for this change.

The New European Logic

The Czech Republic and Poland are not the only European states to have changed their thinking about BMD either. A number of countries are not only are responding warmly to US overtures facilities, but, in some cases, are actually initiating the siting requests.

- First, BMD technology has advanced considerably and is now far more likely to work.[34] When BMD was only a political tool and could offer no real protection, the Europeans were understandably squeamish about participating in the system. But if the system is actually functional, the calculus shifts.
- Second, a weak BMD system designed to guard against Iran theoretically could evolve into a stronger system that helps to protect Europeans against Russia in the future. And at a time when Moscow is growing more aggressive in economic and political terms, laying the groundwork for a military hedge makes sense.

34. Since 2001, 34 tests out of 41 were successful. These include six of nine successes against long range targets, with four using warhead decoys or counter-measures, Employing layered defences, a redundant network of land-based and sea-based sensors and advanced algorithm, ability to defeat counter-measures will be greatly improved in the future, with the introduction of capability to destroy many objects with a single interceptor. (Lt Gen Henry A. Obering III, Response to "Missile Defence Malfunction", Carnegie Council- Ethics in International Policy, May 30, 2008, < www.cciea.org/resources/journal/22-1>)

- Third, it is becoming increasingly difficult for Europeans to define their security interests as separate from those of the United States'. Moscow's new energy strategy is a tool for exerting influence over Europe, making the European states more willing to view Russia through American goggles. BMD fits into the strategic doctrine, and that logic, by association, is now taking hold in Europe.
- Fourth, there is a desire to rope the United States into a multilateral defence stratagem within the framework of NATO. Many Western Europeans begrudge US efforts to dominate the NATO alliance and regularly try to persuade Washington to more seriously consider the European points of view.
- Finally, there is the old axiom "If you can't beat them, join them". Bilateral US security agreements with the Central European states are forging BMD into reality. If it is going to happen anyway, the logic goes, you might as well jump on the bandwagon and reap some of the benefits.

Implications for China

While China has vehemently opposed the US NMD, its opposition to US missile defence efforts has been consistent since the SDI days. Chinese concern over missile defence is due to the dangers of possible nuclear blackmail, unipolarity and the United States' superpower status, the US and Japan alliance on missile defence, and the US assistance to Taiwan. In China's perspective, it is untenable that the US would spend over $100 billion on a system that has only one or two countries in mind, the so-called 'rogue states' which are yet to possess the capability of developing an ICBM. US plans of provisioning TMD systems or technology to Taiwan is a serious concern of China. China considers it an act of attack on its sovereignty and it would lead to the outbreak of a missile race across the Taiwan Strait. It believes that the US is exaggerating the threat as a pretext to garner Japanese assistance in missile defence R&D and to contain China.

In 1998, the North Korean missile launch was followed by the US -Japan agreement in August 1999 for joint development of an advance missile sensor,

Although China is most vocal in its opposition to TMD, it is actually NMD that presents the greater strategic challenge to Beijing.

advance kinetic warhead, second stage propulsion and light weight nose cone design for the navy theatre-wide missile system. China has opposed the US-Japan TMD cooperation stating that the TMD and NMD are closely related and cooperation on TMD would change the nature of the US-Japan military alliance wherein it will encourage Japan to improve its defence industry and shift towards the offensive posture from its present defensive strategy.[35] This would aggravate the tension in the Korean peninsula.[36] China objects to TMD because:

- It would integrate Taiwan into the US-Japan security alliance
- It further elevates the role of Japan in regional security.
- It signals America's intention to strengthen its military presence in the region and prevent China's emergence as the predominant regional leader.

Although China is most vocal in its opposition to TMD, it is actually NMD that presents the greater strategic challenge to Beijing. China's perspective of the US NMD programme is that it will downgrade or negate China's nuclear deterrent which is the smallest (about 20 ICBMs) amongst the five nuclear powers[37]. China has accelerated its ICBM modernisation. It has tested the DF-31, an 8,000 km range (capable of reaching the west coast of the US), solid-fuelled (quick launch capability), road-mobile missile and is developing a longer range version called the DF-41. These modern missiles could carry multiple warheads with decoys, which could help warheads to penetrate missile defences. But

35. Zhu Mingquan, "US Plans On National Missile Defense (NMD) And Theater Missile Defense (TMD): A Chinese Perspective" < http://www.nti.org/db/china/engdocs/zhu1999.htm>

36. Duan, "Tmd, US-Japan Relations, and East Asian Security", The United Nations University, Tokyo, Japan, June 2000, <www.nautilus.org/archives/nukepolicy/TMD-Conference/duanpaper.html> Evan Medeiros, "Issue Brief: Theater Missile Defense and Northeast Asian Security", Monterey Institute of International Studies, August 2001 (Reviewed January 2003)< http://www.nti.org/e_research/e3_3a.html>

37. Charles D. Ferguson, "Bait and Switch: Is Anti-North Korean Missile Defense Designed for China?" *Journal of the Federation of American Scientists,* vol. 52, no. 6, December 1999<http://www.fas.org/faspir/v52m6b.htm>

even though China is modernising its missile force, it still wants to avoid the expense of a massive-strike capability, which would involve hundreds of missiles, and divert funds badly needed in other areas of the military. Matching the US missile for missile or developing a Chinese NMD would require diverting huge money and resources which would be detrimental to Chinese economic growth and emergence as a world power.

Thus, China's space denial effort has provided it asymmetric capability to hedge against the United States' formidable might.

China also appreciates that the confrontation with the US through conventional war-fighting would be suicidal and, thus, China has adopted a diplomatic offensive posture to oppose US NMD efforts in multilateral fora. China also tried to engage the US in the Conference on Disarmament (CD) and Prevention of Arms Race in Outer Space (PAROS) which was rebuffed by the US.

At the same time, Chinese efforts to overcome the US might have come to the forefront with the successful launch of an anti satellite missile in January 2007. As Ashley Tellis put it, "Chinese analysis of US military operations in the Persian Gulf, Kosovo and Afghanistan have yielded one crucial insight: The advance military might of the United States depends inordinately on a complex, exposed network of C4-based systems, through the medium of space. Chinese strategists quickly concluded that any effort to defeat the formidable military power of the US should aim not at its capacity to deliver conventional firepower from long distances but its Achilles heel: its space-based capabilities and their related ground installations."[38] Thus, China's space denial effort has provided it asymmetric capability to hedge against the United States' formidable might.

Implications for India

With the US-NMD deployment in Europe and sharp reaction from the Russian

38. Ashley J. Tellis, "Punching the US Military's Soft Ribs:China's Antisatellite Weapon Test in Strategic Perspective", *Carnegie Endowment for International Peace*, June 2007.

"Sandwiched between two adversaries that work in close strategic collaboration and confronted with real missile threats, if there is any country that needs an NMD, it is India…"

Federation and China, the potential impact of NMD on South Asia cannot be neglected. With the agreement of deployment of the US NMD in the Czech Republic and Poland, the potential impact of NMD on global arms control and on international security dynamics, is bound to influence Indian strategic planning with reference to China and Pakistan.

The US NMD programme and US-Japan-Taiwan TMD/NMD cooperation is forcing China to enhance its strategic deterrent by modernising its missile forces and space denial capability. As China's strategic posture changes, it will influence India's threat perception and subsequently any Indian reaction will influence Pakistan's strategic planning against India. Chinese interpretation of US-Taiwan and US-Japan TMD cooperation as a violation of the Missile Technology Control Regime (MTCR) provides it a suitable excuse to assist Pakistan above the MTCR limits, which will destabilise the regional strategic balance.

The principal driver behind India's nuclear posture is the doctrine of equality in security and disarmament. India's perception on nuclear proliferation and disarmament is through a globally negotiated, time-bound and verifiable disarmament regime and, therefore, India has been a non-signatory to the nuclear Non- Proliferation Treaty (NPT) all this while, despite strong international pressure and sanctions, as India considers the NPT in its present form discriminatory. The US NMD threat to China and Russia will exacerbate the Chinese build-up of an advanced missile arsenal in qualitative as well as quantitative terms, which will signal an arms race in South Asia.

The relationship between India and Pakistan has been even more complex and difficult. The nuclear capabilities of both countries, with their history of past conflicts, leave no ground for complacency, with the attendant risks that may ensue.

The sudden collapse of the Soviet Union forced India to shift its strategic interest towards the US, Israel and Europe. Indian interest in acquiring the

TMD systems such as the Israeli Arrow or US Patriot advance capability system is a move to ensure its credible minimum deterrence and to contain increasing Pakistan's missile capability which is supported by China covertly. As Dr Manpreet Sethi puts it, "… Sandwiched between two adversaries that work in close strategic collaboration and confronted with real missile threats, if there is any country that needs an NMD, it is India…"

The Chinese anti-satellite test on January11, 2007, was astonishing. The technology used to shoot down a satellite is the same as in an anti-missile system. The system has to be slightly reprogrammed to adjust speed in the case of an ICBM. This Chinese development merits serious consideration which makes Indian space-based capabilities vulnerable. Thus, China not only has a credible anti-missile system but also possesses the asymmetric capability to strike war-fighting space-based assets.[39]

The implications of BMD are far too many. India has to stretch its capabilities in multiple spheres, i.e. IRBM, ICBM and cruise missile development qualitatively and quantitatively, achieve the triad of missile launch capability, the ground-based as well as sea-based TMD acquisition and deployment, anti-satellite capability to negate space vulnerability, China's technological advances and 'proxy' space power in Pakistan.

India has ventured into the missile defence programme and its indigenous missile defence effort has also been successful in its first testing of endospheric as well as exospheric modes. It is important to note that India is also moving toward increasing "foreign collaboration," (like the Brahmos programme) to leverage and learn from the wealth of design experience already available. With the India-US nuclear deal coming to fruition, BMD cooperation would also represent a new avenue for enticing India into further strategic alignments with Washington. Though, Japan and Israel have been the Pentagon's strongest partners in development and operational fielding, India would be a noteworthy addition to this field. However, Moscow still holds significant sway with New Delhi. Should these efforts begin to succeed,

39. Srikanth Kondapalli, "China's Satellite Killer: Should India Worry?" January 24, 2007, < www.rediff.com/news >

Some missile defence is evidently better than no missile defence. It is a strategic compulsion.

Pakistan could eventually see the credibility of its nuclear deterrent meaningfully degraded. [40]

The India-US nuclear deal which has recently received the approval from the Nuclear Suppliers Group has boosted India's stature significantly as an international nuclear power and will elevate its stand in the regional security dynamics. It has also brought India closer to the US strategically. All these development will have a negative fallout in the South Asian security context and, thus, Indian effort to acquire a hedge against the capability of China and Pakistan, individually as well as collectively, is a necessity.

CONCLUSION

Missile defence is no panacea and does not guarantee fail-safe operations and survivability of innocent non-combatants. Any amount of sophistication cannot provide 100 percent safety from missile attack and the possessor of NMD will always be vulnerable, may be with less risk, but potentially high consequences.

Still, missile defence has value in limiting the damage. It adds uncertainty to the calculation of any potential attacker. Some missile defence is evidently better than no missile defence. It is a strategic compulsion. There is hardly any chance of development and deployment of nuclear tipped missiles in the strength as that of the US and USSR arsenals during the Cold War. It is not feasible for any country and, therefore, a missile defence shield makes sense because it would be effective against a smaller arsenal.

Further, as Rajesh Basrur [41] puts it: "...Notwithstanding all the perfectly sensible objections to missile defence— that it is technologically questionable, that it is too expensive and that it is unlikely to work very well – its legitimacy lies in its capacity, regardless of the level of its sophistication and its operational

40. "India, US: The Potential for Ballistic Missile Defense Cooperation", Stratfor, January 18, 2008,< www.stratfor.com >

41. Rajesh M. Basrur, "Missile Defense and South Asia: An Indian Perspective" <www.stimson.org/southasia/pdf/SABMDBasrur.pdf>

effectiveness, to enable a significant number of people to survive a nuclear strike…" It has become a moral necessity for a country.

The debate over missile defence has settled in favour of missile defence not because defences have an edge over offensive weapons but due to the strategic compulsions.

Sixty years ago, the world's first missile (V2 missile) attacks showed the need for missile defences and the Gulf War reimposed that need. Today, the threat is lurking real and substantial, but the technology of today has allowed missile defence to be a reality. Today, more than 15 countries (including nearly 10 in NATO alone) are engaged in missile defence efforts of some kind, whether by hosting key facilities or assets on their territory or actively discussing this possibility, pursuing R&D programmes, signing cooperative agreements with the countries that possess the technology or maintaining capabilities. The list includes the United States, United Kingdom, Australia, Denmark, France, Germany, Italy, Israel, India, Japan, the Netherlands, Taiwan, South Korea, Ukraine, Poland and the Czech Republic. Russia also believes in the value of missile defence as it continues to maintain a missile defence system around its major population centre, Moscow, and has developed defences against shorter-range missiles.

The debate over missile defence, about its viability and effectiveness against the threat of ballistic missile, is settled in its favour. It had settled in the favour of missile defence not because defences have an edge over offensive weapons but due to the strategic compulsions. BMD is yet to be proven in an actual battle scenario. Nevertheless, the advancement in technology provides that whether or not the system is viable, it is a new mantra in the present strategic context. The end of the Cold War and emergence of a different world equation premised that newer methods of counter-balance have to be adopted, shunning Cold War beliefs and *vox populi* and with the complex, international and regional security dynamics, along with fast pace of technological advancement in missile lethality, accuracy and range, missile defence has become the "Frontier of the 21st Century".

DEFENCE TRANSFORMATION: AN APPRAISAL

P. K. MALLICK

As we prepare for the future, we must think differently and develop the kinds of forces and capabilities that can adapt quickly to new challenges and to unexpected circumstances. We must transform not only the capabilities at our disposal but also the way we think, the way we train, the way we exercise and the way we fight. We must transform not only our armed forces, but also the Department that serves them by encouraging a culture of creativity and prudent risk-taking. We must promote an entrepreneurial approach to developing military capabilities, one that encourages people to be proactive, not reactive and anticipates threats before they emerge.

—Donald H. Rumsfeld,
Ex US Secretary of Defence

"Transformation", "reform", "modernisation"—whatever one calls change—is not a new phenomenon in the armed forces. Transformation, "generates increased combat power by networking 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."

* Brigadier **P. K. Mallick**, Indian Army, is currently with HQ Integrated Defence Staff of the Chiefs of Staff Committee.

Change is essential, but effecting change is not easy.

Change is essential, but effecting change is not easy. This has been recognised by senior leaders of armed forces throughout history. Defence transformation has preoccupied the US Defence Department (DoD) for over a decade and holds the promise of a paradigm shift in the character and conduct of warfare. At the same time, it is more than simply overlaying new technologies and new hardware on existing force structures; it requires fundamental changes in military doctrine, operations and organisation.

While several countries including India are closely studying and assessing the implications of the emerging revolution in military affairs (RMA), they have, for a variety of reasons, made little progress so far in actually transforming their armed forces along its lines. In fact, most countries are unlikely, despite their best efforts, to move beyond "modernisation-plus," at least not in the near future.

The concept, doctrine, organisation, threat perception, leadership, budget, culture and level of technology used by us in India are at wide variance with the USA. However, we must keep ourselves abreast with all transformational activities happening across the globe, draw the correct lessons, and change the Indian armed forces as per our conditions that prevail in the subcontinent, while keeping a close watch on the Global War On Terrorism (GWOT).

In this essay, a detailed analysis of defence transformation presently in progress in the USA will be carried out. The significance of technology, jointmanship, leadership, logistics, training, culture, budget and limitations of transformation and its implications for the Indian armed forces will be carried out

INFORMATION AGE

What we are seeing, in moving from the Industrial Age to the Information Age, is what amounts to a new theory of war: power comes from a different place, it is used in different ways, it achieves different effects than it did before. During the Industrial Age, power came from mass. Now power tends to come

from information, access and speed. We have come to call that new theory of war network-centric warfare. It is not only about networks, but also about how wars are fought—how power is developed.

—Vice Admiral (Retd) Arthur K. Cebrowski,
Director, Office of Force Transformation,
IEEE Spectrum

Primary Characteristics of the Emerging Way of War

Although the concept of what the future force will look like and how it will conduct military operations is still evolving, two salient characteristics seem to stand out. It will be a joint, network-centric force and it will be capable of executing effects-based operations (EBO), enabled by network-centric warfare (NCW). Already, the combination of modern technology and new operational concepts has enabled networked units and individual platforms to operate together in ways not considered possible just a few years ago. NCW is characterised by the ability of geographically dispersed forces to attain a high level of shared battlespace awareness that is exploited to achieve strategic, operational and tactical objectives in accordance with the commander's intent. This linking of people, platforms, weapons, sensors and decision aids into a single network creates a whole that is clearly greater than the sum of its parts. The result is networked forces that operate with increased speed and synchronisation and are capable of achieving massed effects, in many situations without the physical massing of forces required in the past.

WHAT IS TRANSFORMATION

It is not the strongest of the species that survives nor the most intelligent that survives. It is the one that is the most adaptable to change.

— Charles Darwin

The US DoD has defined transformation in one document as a process that shapes the changing nature of military competition and cooperation through new combinations of concepts, capabilities, people and organisations that

exploit the nation's advantages and protect against asymmetric vulnerabilities to sustain the strategic position, which helps underpin peace and stability in the world. Transformation anticipates and creates the future and deals with the co-evolution of concepts, processes, organisations and technology. Profound change in any one of these areas necessitates change in all. Transformation also identifies and leverages new sources of power. Military transformation is about changing the culture of the armed forces. Therefore, transformational activity must facilitate a culture of change and innovation in order to maintain competitive advantage in the information age. That culture must foster leadership, education, processes, organisations, values and attitudes that encourage and reward meaningful innovation.

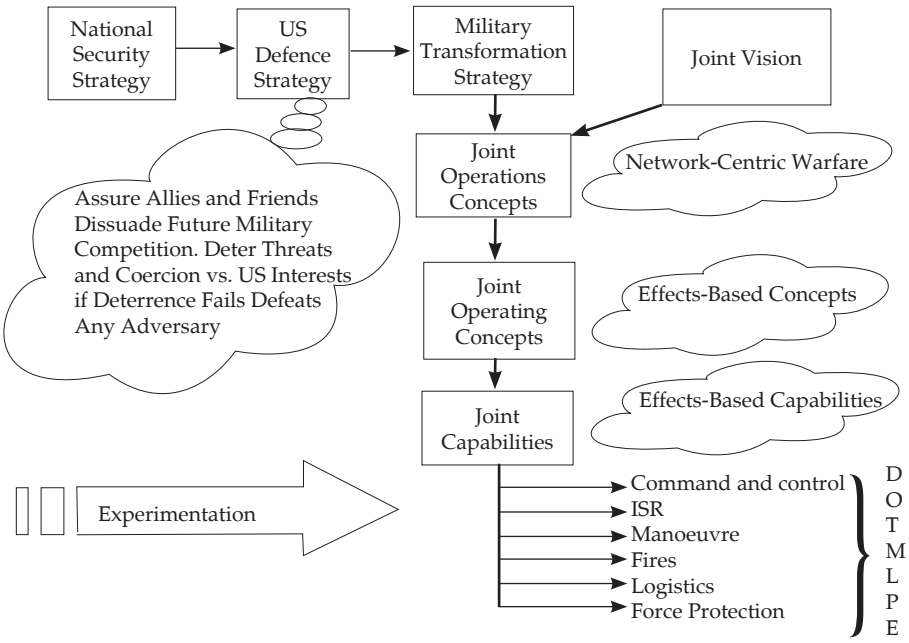
Transformation is a process that shapes the changing nature of military competition and cooperation through new combinations of concepts, capabilities, people and organisations that exploit the nation's advantages.

Office of Force Transformation

To help implement transformation, the US DoD created the Office of Force Transformation (OFT), which resides within the Office of the Secretary of Defence (OSD). OFT is a small office with a staff of fewer than 30 people and an annual budget of roughly $30 million. It reports directly to the secretary of defence. Among other things, OFT issues guidance to the rest of DoD on transformation; reviews and approves transformation plans submitted by the military services and DoD agencies; acts as a generator, promoter and clearing house of ideas for transformation; and generally evangelises in support of transformation.

As illustrated in Fig. 1, military transformation begins at the strategic level. Guided by defence strategy, the military transformation strategy and the joint vision, joint war-fighting concepts are developed. The joint war-fighting concepts will focus on the development and acquisition of joint war-fighting capabilities across doctrine, organisation, training, material, leadership and education, personnel and facilities.

Fig. 1. Military Transformation – Strategy to Concepts to Capabilities



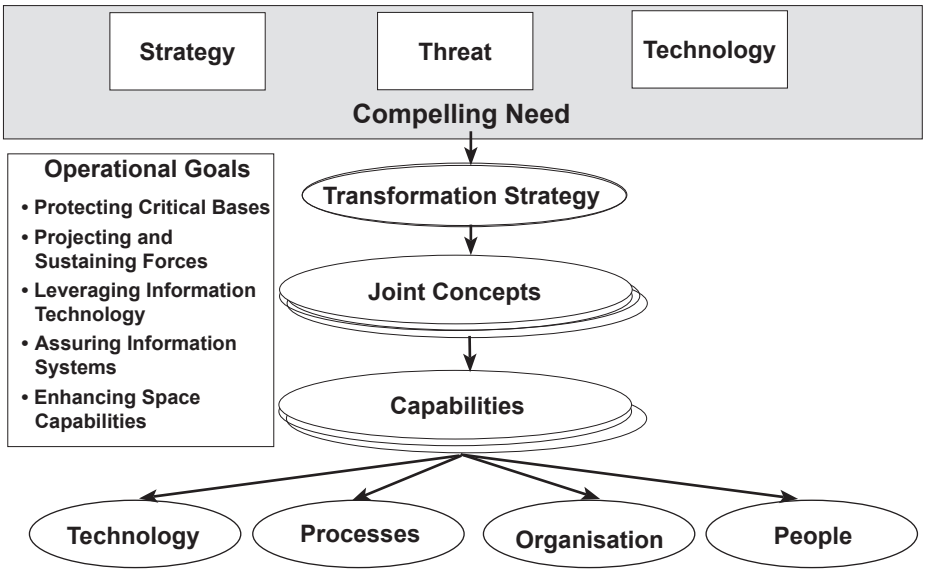
Scope of Defence Transformation

Overall, the scope of defence transformation encompasses three major areas: how business is done inside the department, how work is done with interagency and multinational partners, and how we fight.

Military Transformation Process

The military transformation process depicted in Fig. 2 begins with an analysis of the strategy, threat and technology drivers for transforming the force and the six critical operational goals, which provide the focus for the department's transformation efforts. Transformational capabilities will be attained when the results of concept development and experimentation are implemented in selected elements of the US armed forces.

Fig. 2. Military Transformation Process



Military Transformation Strategy

The department's overall strategy for transforming consists of three parts: transforming culture; transforming processes; and transforming capabilities through force or military transformation. The four pillars that constitute essential elements of the department's force transformation strategy are:

- Strengthening joint operations.
- Exploiting intelligence advantages.
- Concept development and experimentation.
- Developing transformational capabilities.

Successful implementation of the department's force transformation strategy will accelerate the ongoing shift from an industrial age to an information age military. This is a matter of developing competency for the new age. Future military operations will be conducted using more network-centric forces. The tactical and operational effectiveness of widely dispersed forces will be enhanced

by increasing information sharing via a secure network that provides actionable information at all levels of command. This in turn will create conditions for increased speed of command and opportunities for self-synchronisation across the battlespace. The first step towards the development of a network-centric joint force is to invest more now in the four military transformation pillars.

JOINT TRANSFORMATION

Separate ground, sea and air warfare is gone forever. If ever again we should be involved in war, we will fight in all elements, with all Services, as one single concentrated effort. Peacetime preparatory and organisational activities must conform to this fact.

— President Dwight D. Eisenhower

At its extreme, jointness means the full integration of the different Service divisions,i.e., where capabilities are "born joint." Jointness would be far more prevalent and would penetrate further into each Service than it has in the past. This concept of jointness seems consistent with the Services each retaining the responsibility and authority to create and sustain specific defence capabilities but engaging jointly in planning the capabilities needed, allocating the capabilities across the Services, deciding on battle plans and tailoring the modules to be deployed.

Meanwhile, each of the military Services has been developing new operational concepts to implement Joint Vision 2020. The navy has focussed on NCW, using new information technologies to link the forces together digitally. The air force has concentrated on EBOs, which assess how best to destroy the enemy, with minimal collateral damage. The army has focussed on rapid decisive operations (RDOs), that is, reaching the conflict quickly and acting before the enemy can react. Elements of these three strategies are merging together.

TECHNOLOGY

It is not that Generals and Admirals are incompetent, but the task has passed beyond their competence. Their limitations are due not to a congenital

stupidity—as a disillusioned public is so apt to assume—but the growth of science, which has upset the foundations of their technique. The only way of salvation would be to survey the problems in complete detachment and from the widest point of view.

— B. H. Liddel Hart
From Thoughts of War

What Weapons and Systems are Transformational?

Although transformation involves changes in organisation and concepts of operations, much of the debate over transformation has centred on which military weapons and systems should be deemed transformational or not. Experts disagree on this question, even when working from a common definition of transformation. As a result, lists of weapons and systems that qualify as transformational differ from one source to the next. Weapons and systems that have frequently been identified as closely associated with the Administration's transformation vision include but are not necessarily limited to the following:

- Command, control, communication, computers, intelligence, surveillance, reconnaissance (C4ISR) systems that link military units into highly integrated networks for conducting NCW.
- Forces for countering terrorists and weapons of mass destruction.
- Space systems.
- Missile defence.
- Unmanned vehicles.
- Special operations forces.
- Precision-guided air-delivered weapons.
- Lighter and more mobile army ground forces.
- Smaller and faster navy surface ships.

A few technologies stand out as especially needed for today's new missions:

- Unmanned aerial vehicles (UAVs) and space-based radar for persistent surveillance.
- Information operations, both offence and defence.
- Storage and retrieval of information—data mining.
- Tagging for tracking, identification and forensics.
- Space control.
- Biochemical defence.

Critics say that transmitting accurate information in real-time to systems and units that can act on it immediately is the challenge. Because battlefield information and intelligence flows through and across multiple organisational boundaries and interfaces, it will inevitably be delayed, altered, or otherwise distorted. Staffs will take time to analyse and interpret new information and propose courses of action rather than immediately pass it unfiltered to subordinate and adjacent formations

Separating the important from the unimportant has always daunted commanders and staffs. Time rushes on as commanders and staffs wrestle with the thorny problems of battle command. What is the best system to engage an emerging target? How can we be sure who is really there? Is this important enough to postpone other engagements? What about collateral damage and innocent civilians? How much information should be pushed down to small units and how much can they digest? Who else needs to know? Who must approve the strike?

These and other factors affect the technical problem of data transmission. They are not trivial concerns, nor are they particularly susceptible to technical solutions. In fact, the explosion of automation and computer systems in headquarters has brought an increase, not a decrease, in the size of headquarters staffs. So long as people make battlefield decisions, they will stop and think. So long as militaries are hierarchical, commanders

The explosion of automation and computer systems in headquarters has brought an increase, not a decrease, in the size of headquarters staffs.

will use their discretion. Whenever information crosses an organisational boundary, it will be altered, however subtly.

Advanced command and control (C2) is a two-edged sword: it can lead to less centralised operations or more micromanagement from far. The reality is that satellite communication has allowed decisions on the battlefield in Iraq or Afghanistan to be made at Headquarters (HQ) Central Command in Tampa, Florida. Sometimes involvement at the highest HQ is necessary as we have seen in the case of the siege of the Hazratbal shrine by terrorists when, in the glare of the media, operations are carried out live and there is no time to go through all the intermediate formations. Of course, intermediate formation HQs will feel left out.

Experience in the streets of Mogadishu, in the air over Kosovo and in Afghanistan and Iraq suggests that severe weather, air defence, complex terrain and urban environments still make combat a very close fight. Critics say that the most critical transformational weapon today is the improvised explosive device (IED) used by insurgents and terrorists. Technology has its limitations in close combat.

CULTURE AND INNOVATION

Transformed Culture and Processes

The strategy for achieving transformation in the Department of Defence must begin with an effort to transform the overall culture into one where innovation and informed risk taking are encouraged and rewarded – a culture that is characterised by the information age. This must be done through leadership development and education, an increased emphasis on concept development and experimentation and changes in the personnel system and incentive structure. Senior leadership must set the example by fostering innovation and adopting information age technologies and concepts.

Innovation = Creativity x Implementation

Innovation, so vital to the transformation process, is dependent upon creativity, the development of new organisational and operational

concepts, processes and technologies. For meaningful innovation to occur, however, creativity alone will not be sufficient; implementation is equally important. Without interested customers to conduct experiments, demonstrations, tests and evaluations and ultimately, adopt new concepts, processes and technologies for the conduct of real-world operations, innovation will not occur.

Together, creativity and implementation will have a multiplying effect in providing own forces with innovative new capabilities. We must encourage innovation and the sharing of knowledge and operational experimentation among the Services. This will enable to discourage and ultimately defeat of the development of new capabilities and effective asymmetrical strategies by adversaries.

LEADERSHIP

If the mind is to emerge unscathed from this relentless struggle with the unforeseen [in war], two qualities are indispensable: first, an intellect that, even in the darkest hour, retains some glimmerings of the inner light which leads to truth; and second, the courage to follow this faint light wherever it may lead.

— Carl von Clausewitz

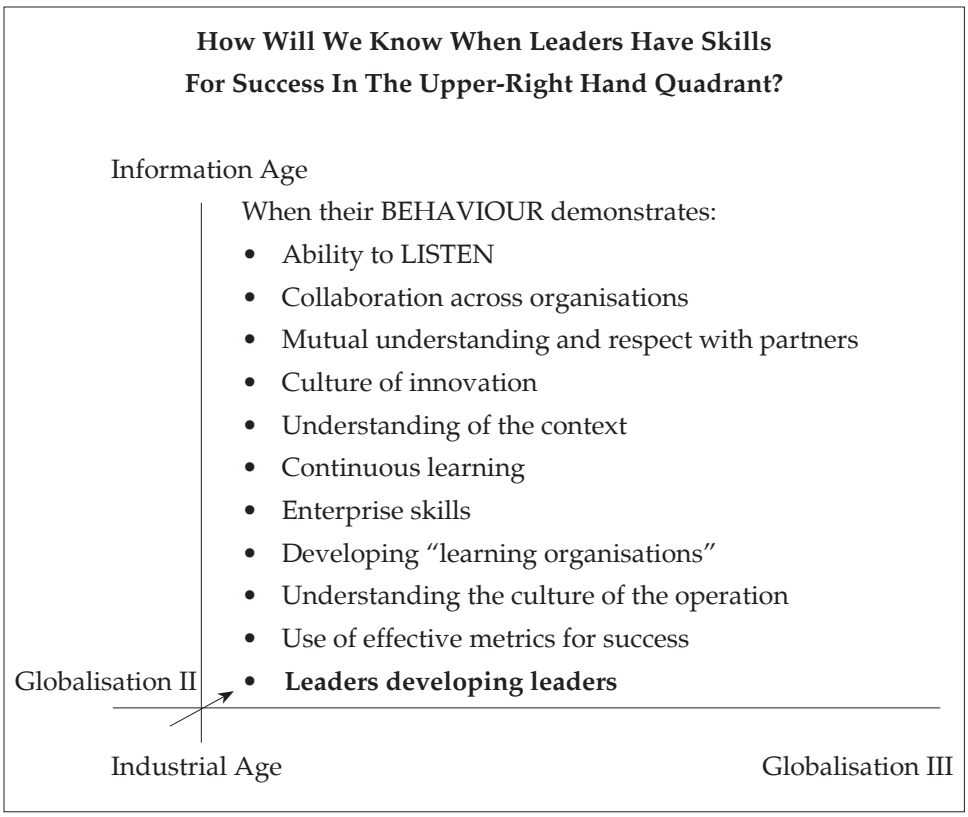
The leadership development process must result in leaders who are competent, have the right education and experience through schooling and assignment processes, are of sound character and integrity, cherish dignity, have the self-discipline to always do what's right and understand human nature and how they can influence human nature at any given point to accomplish the mission. The leader must also be confident in his own abilities to operate independently if

The leader must also be confident in his own abilities to operate independently if necessary and on operations with direct visibility to the highest levels of government and army leadership.

necessary and on operations with direct visibility to the highest levels of government and army leadership. The leader must have the confidence in the capabilities of subordinates where trust among all is second nature and never questioned.

"I don't need someone who's only good at the killing and breaking, I need somebody who has the breadth of education experience and intellect to take on all the rest of these missions that he or she is going to be saddled with when the shooting stops or when it subsides to some level. They're the ones that are going to count on the ground out there, more than anything else. And I think that's the issue in any discussion as to what happens to our military from here on out."(Source: Gen Anthony Zinni, Address at the Marine Corps Association and Naval Institute: Forum 2003: "How Do We Overhaul the Nation's Defense to Win the Next War?", Crystal Gateway Marriot, Arlington, VA, September 4, 2003).

Retired US Army Chief of Staff Gordon Sullivan warns about this very same point when he cautions, "The old maps, the old ways of doing business will not work in today's new territories. Simply improving an existing process will not solve a problem… Doing the same thing you have always done—no matter how much you improve it—will get you only what you had before"(Sullivan & Harper, *Hope is not a Method*, New York : Times Business 1997, p.152). Military thinker Trevor Dupuy in his book *Understanding War* (1987) advanced an important idea about the actual importance of technology in warfare. In the chapter "Technology and Human Behavior in Combat", he asserted that historical data about war indicates, "No technology, no weapon, however great its actual or potential lethality, has been more important for the winning of battles or wars as the men who controlled the weapons … the essential nature of war has not changed. Wars are fought by men and there has been no discernible difference in the fundamental nature of man over the past five thousand years of recorded history. Because the nature of man has not changed, neither has his basic objective when he turns to war: the employment of lethal instruments to force his will upon other men with opposing points of view."



Innovative Change Agents Discouraged

One widely recognised ingredient for successful transformation has been a visionary group of visionaries with relatively persistent tenures, that dare to conceive of bold new ways of conducting warfare. Admiral William Owens asked before he retired. "Where is the revolutionary who will lead the RMA?" There was no one he could point to. No Billy Mitchells, no Alfred Mahans, no George Pattons, no George Marshalls. What is different about the army now versus times in the past is that there are currently no rewards for risk taking and even the smallest mistakes are punished. As an officer in the US Army Command and General Staff College Survey stated, "Risk aversion has become a military cultural thing; commanders are not willing to take risks (and subordinates know it)."

Most effective armies throughout history have had only 3 to 8 percent of their numerical strength in the officer corps; the US has 14.3 percent.

Few incentives exist for commanders to protect their mavericks in today's army. Since one bad or merely neutral officer evaluation report (OER), can ruin a career, a highly risk averse senior rater can derail an innovative change agent easily. Supporting evidence comes from the survey: top-down loyalty does not exist. Senior leaders will throw subordinates under the bus in a heartbeat to protect or advance their careers. This trend is not only found in the US Army. In 1996, terrorists blew up a US apartment building in Saudi Arabia after the commander had argued for increased security consistently for months. He was blamed for the attack despite his efforts to avoid this outcome. The chief of staff of the US Air Force attempted to save this officer's career by preemptively resigning as the responsible commander, but the local commander was forced to retire anyway. This pattern strongly suggests that high levels of risk aversion are being institutionally reinforced in US military organisations.

The US Army has 3,700 colonels but only 33 manoeuvre brigades: the navy has 3,500 captains but only 359 ships. Most wind up on staff duty, whether they are needed or not. Most effective armies throughout history have had only 3 to 8 percent of their numerical strength in the officer corps; the US has 14.3 percent. The bloated headquarters only create unproductive paper work for already hard pressed units who are short of officers. This dichotomy has to be resolved.

LIMITATIONS

> *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 realised there is something more to it.*
>
> **— Colonel John Boyd**

As the US Army's force deployment challenges in Afghanistan and Iraq have demonstrated, the United States military is not organised, trained, or equipped to conduct protracted counter-insurgency and counter-terror operations on a large scale. In particular, the manpower requirements to sustain these counter-insurgency campaigns are considerably greater than those that can be supported by the current force structure. Indeed, recent US history finds US forces conducting a remarkably high number of "regime change" operations (e.g., Panama, Haiti, the Balkans, Afghanistan and Iraq). This greatly increases the demand for forces capable of conducting stability operations until a new government can be formed and indigenous forces trained to assume responsibility for the country's internal security. As the Balkans, Afghanistan and Iraq have shown, these operations can be protracted in nature, especially in cases where a robust insurgent movement develops. The features of insurgency—blending into civil population, superior human intelligence, enlarging its organisation in time, unconstrained in choosing the time, location and type of attacks, being free from legal constraints, use of media to its advantage—make it a force with its own networking and situational awareness.

This trend may well continue, whether or not the US military conducts regime change operations. This is because adversaries confronting states with overwhelming advantages in conventional capabilities (e.g., the United States) have often adopted unconventional methods of waging war to offset these advantages. Although the US military's record in such operations is mixed, institutionally the armed forces have shied away from fielding forces structured for irregular warfare, for several reasons. First, irregular warfare operations are typically manpower intensive, while the US military has become increasingly capital intensive.

The features of insurgency make it a force with its own networking and situational awareness.

Technological sources of intelligence were of little value in Somalia. Commanders relied on human intelligence as the primary source of information. As Gen Anthony Zinni, then director of operations

"Our vast intelligence system can create such a haystack of data that finding the one needle that will pinpoint a target in the right time-frame is difficult, indeed."

at the United Nations Task Force Somalia recalled, he had access to very good technical intelligence, but sensors could not "penetrate the faction leaders and truly understand what they were up to. Or may be understand the culture, the clan association affiliation, the power of the faction leaders and may be understanding some of the infrastructure too." Because of ambiguities in target selection and identification, many targets were hit unintentionally. Mistakes occurred not because of a lack of information; the sheer volume of data and the difficulty in separating good from bad information presented difficulties. As Secretary of Defence William Cohen attested after the war, "Our vast intelligence system can create such a haystack of data that finding the one needle that will pinpoint a target in the right time-frame is difficult, indeed." The best-known intelligence failure was the bombing of the Chinese Embassy in Belgrade.

Strategic and operational uncertainties were amplified at the tactical level. Soldiers and marines operated in a populous, congested urban area in which almost everyone was armed; it was difficult to distinguish between friendly forces, neutrals and those opposed to the humanitarian effort. For marines and soldiers, the complex social, political and geographical environment blurred distinctions between peace-keeping operations and combat operations. Maj Gen Tom Montgomery remarked, "If this isn't combat, then I'm sure having a helluva nightmare."

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:

> Technologies dictating concepts—find an enemy and a method worthy of our weapons. This is a very serious problem with us. We have the technology

netcentric warfare so let's come up with a military theory that supports it. What's good for IBM has got to be good for the army—build me a network and the enemy will collapse. Build me a net and the enemy will come. Well, we're learning about that, aren't we? The enemy adapts. He says, "You want a net? I'll build a net and I'll build it with tribal affiliations and execute with notes passed in the middle of the night and through backyard deals. And you can build all the nets you want, but I'll beat you at your own game." I think the bill on netcentric warfare is something around a trillion dollars. I've been to the Office of Force Transformation. It's incredible that people are still living in a realm of fantasy. Try to talk to these guys about the enemy and about war being a two-sided affair and they look at you as if you have a tree root growing out of your head. Be careful of the moniker and the bumper sticker—be careful of net this and net that. I wrote a piece a few months ago called, "Culture-Centric Warfare." I told my editor, "Look, if I don't put *centric* on something, you guys won't publish it."

Give me an enemy worthy of my weapons...please. Do you ever notice that we only decide to fight China during the Quadrennial Defense Review? Do you ever notice that? "Give me a peer! Who can make a carrier? China. Okay, they're the enemy." It's this whole idea of technology driving doctrine instead of doctrine driving technology

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 percent Army and Marine Corps. It's got everything to do with winning the war on the ground. The enemy has ceded us the global commons. We own space, the air and the sea.

You need a catalyst for reform. Normally, it's a person. You need a Donn Starry. You need someone who has the unique skills, not so much as a visionary, Donn Starry will tell you that he was not a visionary; what he was, was an individual

who knew how to move an institution forward. He knew how to manipulate the elements of change in order to get the most from the process.

You've got to experiment. Experiment in minute increments. Experiment over and over and over again. You might have a grand event, but it needs to be cheap, it needs to be repetitive, it needs to be distributed and it needs to be run by captains and majors and may be lieutenant colonels—not by generals and heads-of-state. That's how change occurs.

We must kill with immediacy and discretion. Immediacy—we're still too slow in how we kill and we're still relatively indiscriminate. We need to be able to kill someone on the other side of the wall, rather than dropping a building in Fallujah and we need to do it within seconds and not minutes. The Air Force is very proud of the fact that their reaction time for close air support has gone from an hour and 15 minutes in Korea, down to about 20 to 25 minutes now—that's still too long. It should be two minutes, not 20 to 25 minutes, in this type of war.

What happened after 9/11, I would argue, is that it shifted to the other way—we're now living in a world that's driven by Red. Osama bin Laden doesn't care about joint doctrine. He controls the clock, he's driving change, he's adapted very quickly and he really doesn't care about any of our structures, about mimicking anything that we do whatsoever. So what does that mean—for you? What it means is the onus for adaptation—for increasing the pace of adaptation—is on you, not on him. Until we're able to do that, until we're able to cast forward and get away from the practical present and think of the theoretical future, we'll never be able to close that gap.

IMPEDIMENTS TO DEFENCE TRANSFORMATION IN THIRD WORLD COUNTRIES

Several factors currently inhibit defence transformation. The first comprises costs and resource constraints. Transformation doesn't come cheap, despite assertions made early on by some proponents that the exploitation of

commercial off-the-shelf (COTS) technologies would greatly reduce costs. Rather, even to make a start requires the acquisition of many new and expensive types of military-unique systems. Even many dual-use COTS information and communications technologies are not easily adapted to military use, as they often require substantial modification, such as ruggedisation or additional capabilities

At the same time, funding for transformational systems must generally compete with large and expensive "legacy" programmes—such as fighter aircraft, tanks and large warships, as well as huge manpower costs usually associated with sizeable ground forces. Also, the US economy can only support its military for expensive transformation efforts.

The organisational and institutional cultures found in most militaries impede transformation. Militaries in the Third World are often extremely conservative, risk-averse and highly bureaucratic organisations. Of course, large organisations anywhere, certainly militaries and Defence Ministries, are typically resistant to change, especially disruptive change, since it can threaten the stability of normal day-to-day operations, standard operating procedures, war plans and even career paths. Armed forces are especially hierarchical, with heavily top-down command-and-control structures.

Another implication of the decidedly conservative nature of regional defence establishments is a characteristic preference for traditional systems. Militaries often prize large and conspicuous weapon platforms—such as main battle tanks, modern fighter aircraft and aircraft carriers—more than less visually striking but transformational systems, such as unmanned aerial vehicles (UAVs), command, control, communication, computers, intelligence (C4I) networks and precision-guided munitions. In addition, high-ranking military officials have tended to prefer immediate, high-profile hardware acquisitions over longer-term software fixes.

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Many militaries also lack any tradition of joint operations and instead possess strong single Service cultures and severe inter-Service rivalries.

Many militaries also lack any tradition of joint operations and instead possess strong single Service cultures and severe inter-Service rivalries. In such a state of affairs, it is doubly difficult to introduce ideas of jointness, interoperability and combined-arms operations as basic war-fighting concepts, or to create common C4ISR and logistical support systems.

Most defence technology and industrial bases are ill equipped to contribute much to defence transformation. Most regional defence research, development and industrial bases lack the design skills, technological expertise, or links to advanced commercial technology sectors needed to develop and manufacture transformational systems. In particular, the defence industries do not possess sufficiently advanced systems-integration capabilities to link together highly complex systems of systems such as C4ISR networks. In addition, heavy emphasis in most of these countries on self-reliance in arms production means that resources are often wasted on duplicating the development and manufacture of weapon systems already widely available on the global arms market.

Militaries and defence industries have few strong linkages to innovative local industries, such as the information technology sector, limiting the potential for "spin-on"—that is, from commercial to military. Most regional arms industries are state owned and insulated from both market forces and the private sector. This demarcation, however, makes it more difficult for the defence sector to benefit from cross-fertilisation with commercial technologies, as well as making it harder and less attractive for civilian industries to participate in military research, development and manufacturing. At the same time, local militaries in general remain distrustful of commercial off-the-shelf technologies and prefer "mil-spec'ed" equipment. However, if the Tatas can manufacture Humvee vehicles for the US Army, they can surely meet our requirements. The point is: what will happen to white elephants like Ordnance Factory Board (OFB) units like the Vehicle Factory? The armed forces suffer silently.

Exploitation of dual-use technologies for defence transformation is unlikely to occur to any large degree.

For the last 50 years, India has been trying to set up a defence industrial base, yet we are not far down the road. In the early 1980s, a big push was given to the process with the expectations that the 2000+ cycle will see the Indian armed forces equipped with India-made tanks, light fighter aircraft and surface-to-air missiles (SAMs). In 1997, the government announced that a 10-year plan had been made to increase the ratio of expenditure on procurement from domestic sources from 30 percent to 70 percent by 2005. We are nowhere near achieving it.

Consequently, exploitation of dual-use technologies for defence transformation is unlikely to occur to any large degree. While nearly all countries see the great promise of advanced commercial technologies for military uses, particularly information technologies, or space, few have made actual, deliberate and concerted efforts to engage in such spin-on. Most exploitation of dual-use technologies in the region has so far been modular, that is, simply "piggybacking" on existing or emerging commercial systems (such as nationwide fibre-optic telecommunications networks) rather than adapting commercial technologies to military purposes. Great work has been done to put information technology (IT) and communication networks in place at least up to Brigade Headquarters level. But what is the use of these infrastructures if we don't use them to our advantage. Where are the application softwares for use? Maximum use of this fantastic communication network in our army is to see MS Branch postings and promotions. Our young officers and men are good, smart and technology savvy. It is not possible to stop them using internet, cellphones, SMS, email, blogging. Yet the danger is that the more one uses networked technology, the more is the security vulnerability. Our officers and men will talk to their parents or wives from battlefield, they will use blogs to exchange their views on ongoing operations with people all over the world. What is our response as an institution? As a typical hierarchical and rigid organisation, we always fall behind in the race and are reactive in formulating policies.

The danger is that the more one uses networked technology, the more is the security vulnerability.

Most countries in the Indian subcontinent region, despite their best efforts, are unlikely to transform their militaries to the extent made possible by the information revolution and the emerging revolution in military affairs, at least not in the near future. There are simply too many factors to move beyond modernisation plus. These factors particularly include budgetary constraints; cultural, organisational and bureaucratic resistance; weaknesses in national defence technology and industrial bases; and under-appreciation of the complexity of adapting commercial dual-use technologies to military purposes. Overall, defence transformation may simply be too disruptive and too threatening to military and civilian elites, too expensive and technologically too demanding.

INDIAN SCENARIO

The Indian Ministry of Defence is one of the largest spenders, employers, industrial complexes and scientific experts in the world. ….Somehow paradoxically, although the number and rank of the people involved have also expanded, there has not been really innovative or even significant change in the way, that problems are analysed or handled and the concept of "tradition" has been used to circumvent the obvious need for change.

— Arun Singh, Former Minister of State for Defence

In India, transformation can be necessity driven, personality driven, backed by the government or media driven. After the 1962 debacle, massive expansion took place, Mountain Divisions were established. The results started showing immediately in the 1965 War, and even more in the 1971 operations. This can be an example of necessity driven transformation. Thereafter, in the 1980s, a major modernisation and reorganisation took place under the guidance of Gen K. Sunderji. The changes were incorporated in the following stages:

(a) **Speculation.** This was done with the publication of concept papers, journal articles, studies, formation of groups to study lessons of recent wars, etc. Gen K. Sundarji, as commandant, College of Combat, initiated these and himself wrote an influential series of papers laying out theoretical doctrine and deployment plans for Indian nuclear weapons in 1980–81. He had a grand vision of change.

(b) **Experimentation.** Establishment of experimental organisations and testing grounds, field training exercises to explore new warfare concepts and war-gaming at field formations and Category 'A' establishments were carried out.

(c) **Implementation.** Establishment of new units, revision of concepts, establishment of new branches and changes in curriculum of professional military educational institutions were carried out. As a result of which we have the Mechanised infantry. Large scale modernisation took place in the Armoured Corps, Artillery, Engineer, Signals and AD Artillery. Army Aviation came into being. Gen Sundarji had the vision and influence both within the army and the ministry, and bureaucracy and leadership to carry out the changes. He had a comparatively long tenure, and he could cultivate the subordinate leadership and followed up the changes.

However, the change process was orchestrated much earlier. Gen K.V. Krishna Rao in his memoir (*In the Service of the Nation, Reminiscences,* Viking, 2001) has articulated how as chairman of the Expert Committee with members like eminent soldiers such as Lt Gen M L Chibber and Gen K. Sunderji, he had started the process earlier and carefully nurtured the programme as deputy chief of Army Staff, vice chief of Army Staff and ultimately as chief of Army Staff. Continuity was maintained. A bunch of sharp, intelligent, progressive officers, not afraid to think out of

Most countries in the Indian subcontinent region despite their best efforts, are unlikely to transform their militaries to the extent made possible by the information revolution and the emerging revolution in military affairs, at least not in near future.

the box, were identified and carefully nurtured under the mentorship of Gen Sunderji to carry forward the change process. Above all, Prime Minister Rajiv Gandhi firmly backed the effort of major changes in the armed forces. This was a case of transformation of the Indian Army, one can argue. This can be an example of personality driven transformation. However, the worst form of transformation may be media driven. If in the next five or six years, we do not change, there will be tremendous pressure from the media to change. Our media is yet to acquire the knowledge and vision on defence related matters to drive such a change. The outcome may be disastrous. Clearly, time is running out. But where are the intellectual leaders with vision to drive the next transformation efforts of the Indian armed forces?

Bureaucracy

India's labyrinthine bureaucracy offers additional barriers to innovation and change. The civilian side has always dominated civil-military relations in India. The Ministry of Defence and Ministry of Finance, composed largely of career bureaucrats, have dominated procurement and budget decisions. The role of the military in determining policy and procurement has been deliberately minimised. Without fundamental changes in the Indian defence bureaucracy, any rapid change in the armed forces is difficult to come through.

The example of non-finalisation of the Tenth Defence Plan yet can be an example of how the bureaucracy works. The plan was for the period 2002-07. We are now in 2008! The Third Report of the Standing Committee on Defence (2004-05) (Fourteenth Lok Sabha) presented to the Lok Sabha on April 25, 2005, has been scathing in its criticism. It states:

> The Committee express their serious concern that despite their strong recommendation for an immediate finalisation of the Tenth Defence Plan with committed allocation, there has been little progress, with no firm indication of annual outlays for the remaining 2 years of the Tenth Defence Plan by the Ministry of Finance. The Committee note with serious concern that the Ministry

> has itself admitted that some compromises are inevitable in the absence of a formally approved plan. …..The Committee are not convinced with the sketchy reasons advanced by the Ministry for delays and feel that the Ministry had neither shown any urgency nor followed up with the Ministry of Finance to get the firm commitment of funds to finalise the Plan. The Committee are unhappy to note that instead of approaching the Ministry of Finance for supplementary allocation, the Ministry of Defence has felt content to bank on delays on the part of suppliers or some slippage taking place in already concluded contracts so that the Ministry could progress new projects out of available allocation. This shows a casual approach on the part of the Ministry to pursue for higher allocation with the Ministry of Finance and goes contrary to Government resolve to eliminate all delays in Defence Modernisation. The Committee feel that it tantamounts to compromising the security concerns of the nation. The Committee, therefore, desire that the Government should immediately finalise the Tenth Plan with firm indications of funds for the remaining years of the Tenth Plan without any delay so that the modernisation process can proceed smoothly.

Budgetary Support

"Forget knowledge is power, …money is real power." The most important part is the availability of funds to carry out major transformational efforts. Even a country like the USA is finding it tough to carry out modernisation plans. They are unable to acquire costly new weapons and equipment as well as increase the strength of the army or marine corps when any soldier who has fought counter-insurgency operation will vouch for the requirement of more boots on the ground. The same problem would come up if and when the Indian Army tries to transform. During the 1980s, the Reorganised Army Plains Division (RAPID) was created by reducing a brigade from the division structure on the assumption that manpower thus reduced would be replaced by force multipliers and

The most important part is the availability of funds to carry out major transformational efforts.

surveillance efforts. However, the financial resources were never allotted for the technological wherewithal.

There has been a downward trend in the percentage share of gross domestic product (GDP) spent on defence. The Third Report of the Standing Committee on Defence (2004-05) (Fourteenth Lok Sabha) was forthright in stating:

> The Committee are deeply concerned to note that the Ministry of Defence was compelled to surrender funds to the tune of Rs. 5,000 crore, Rs. 9,000 crore and Rs. 5,000 crore at the Revised Estimates stage of 2001-02, 2002-03 and 2003-04 respectively, to meet the deficits. The budgetary ceilings imposed by the Ministry of Finance in the year 2005-06 have led to the downsizing of the total projected capital requirements of the Defence Services from adequately Rs. 44,123.86 crore to Rs. 34,375.14 crore which fails to address the security concerns of the nation. The arbitrary caps on budget utilisation over a period of time have taken a toll of almost all sectors of defence like manpower in the Navy, the ongoing modernisation, infrastructure development, procurement of equipment/ acquisitions, indigenisation and R&D initiatives. The across the board cut applied by the Ministry of Finance on defence expenditure without undertaking any exercise to check the ramifications of their decision on defence preparedness, calls for an immediate review. The Committee feel that there should not be any cut or reduction in the defence budget by the Ministry of Finance at any stage. However, considering the present defence expenditure of some of our neighbours and the present security scenario, the Committee feel that there is a need to fix a minimum percentage of our GDP which should be made available to the defence forces at all costs every year.

Joint, Combined or Integrated Warfare

Even after four wars and innumerable crises, we have failed to evolve joint doctrine and concepts. We are in the process of starting the journey. Transformation of the military must be based on a new joint doctrine which follows a top-down 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 capabilities. In some senses, provision of an enabling environment of jointmanship and stamping them 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."

Future

Probably it is good that no major transformation effort is on the anvil in India. Now is the time for a vigorous, healthy debate to encourage criticality and participation at all levels, modify the concepts and doctrine keeping in view the future as well as lessons learnt in recent operations and sub-conventional warfare, empower people, communicate to all about our vision and transformation plans, identify intellectual leaders in the armed forces, carry out experimentations in theory as well as in training exercises, and institutionalise the change process. Training Commands like ARTRAC and all the Category A establishments have a major role to play in giving the intellectual stimulus. We should have regressive planning which means directions are given from highest strategic body to the lower echelons of command. Our political leadership shies away from giving written directions to the Service chiefs. We must have a National Security Strategy followed by a National Military Strategy, followed by five-year Defence Plans like the 11th or 12th Plan and a Long-Term Perspective Plan. Based on the Joint Vision statement issued by the CISC, the respective Services should issue their individual Service Vision statements. We must think about capability-based planning in place of the existing threat-based planning. No transformation can take place without active support and budget allotment by the government. The armed forces should go back to the government with our present capability and

Transformation of the military must be based on a new joint doctrine which follows a top-down and not a bottom-up approach.

Change must be directed from outside the military in order to transform it and achieve true jointness.

ask them what they want us to do. A clear-cut message should be given, if a particular capability needs to be acquired, about what should be the budgetary effect. Hopefully, by the time all these issues are resolved, visionary leaders, both in uniform and outside will emerge to carry the transformation forward. Perhaps Captain Alfred Thayer Mahan's great generalisation that no military Service should or can undertake to reform itself is valid. Change must be directed from outside, the military in order to transform it and achieve true jointness. Perhaps, somebody with knowledge, vision and commanding respect within the strategic community like Arun Singh would meet the requirement.

We have to keep the Service culture always in mind. All the debates, systematic study and analyses have to be carried out now. As Col Douglas Macgregor, testifying before the House Armed Services Committee on July 15, 2004, on "Army Transformation: Implications for the Future," states, "Whenever an Army Chief of Staff makes a pronouncement, regardless of whether the pronouncement is based on sound analysis and accurate data, every officer knows that in order to be promoted, he or she must sign on unconditionally for the 'party line.' In this cultural setting, there is no argument, no debate and no experimentation."

CONCLUSION

Let noble thoughts come to us from every side.

— Rig Veda

The US military transformation is a project mandated by strategy, threat, technology, risk imperatives guided and shaped by operational goals and the military objectives of the US defence authorities. It is unique to the USA. Application of this model is not feasible for any military, let alone India's. However, US military transformation provides important lessons which we can learn.

Achieving transformation is by no means certain. First, the process is complex because it affects many different and fundamental aspects of the joint war-fighting system. Second, change is always resisted in favour of the status quo. Third, transformation competes for both attention and resources with other important, immediate demands on the ministry, notably counter-terrorism, counter-insurgency operations and internal security. Fourth, there is an increasing demand on resources for current operations vis-a-vis investments in the future. Finally, transformation is a journey, not a destination. Decision-making will need to be tailored to this reality, i.e., more emphasis on the management of change versus traditional management of major new programmes.

Of course, it is easy to criticise. Change, especially radical change, inherent in the RMA, is always hard and it is human nature to be suspicious of, and hostile toward, the unknown. It should not be surprising to see so much organisational, institutional and cultural resistance to the idea of transformation. Moreover, transformation as a concept suffers from the fact that it is basically an open-ended, continuous process since there will always arise new technological innovations that can affect the character and conduct of warfare and, therefore, military doctrine and organisation. When does a military decide that it has finally and successfully transformed itself?

The US military transformation is a project mandated by strategy, threat, technology, risk imperatives guided and shaped by operational goals and the military objectives of the US defense authorities.

At the same time, however, transformation along the lines of the US model may not be necessary to "get the job done." A modernisation plus strategy that is evolutionary and sustaining innovation alone may be sufficient to meet our defence requirements, particularly with respect to the strategic context (that is, the immediate threat perceptions and defence requirements) and the available resources. We do not need to emulate the American transformation paradigm in order to derive valuable new capabilities and other benefits from their current modernisation efforts. A partial solution could be more than adequate.

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