CHAPTER VII

FOURTH GENERATION WARFARE- INDIA & THE ROLE OF AIR POWER

India faces challenges like never before when it comes to tackling the lower end of the spectrum of warfare. The ongoing conflict with the Naxalites and the terror attacks in Mumbai are but grim reminders of this new reality.

4GW & India

The contest for legitimacy in India involves the same four general elements as elsewhere – control, security, economy and identification. But as in every case, the specific nature of each of these elements is unique to India. India is a large country, heavily populated, and interspersed with widely diverse terrain. Many segments of the country are isolated due to lack of roads, limited communications infrastructure, restrictive terrain and limited government presence. Dense population makes it easy for insurgents to blend in, plan and conduct operations without being identified. In order to exercise control, the Indian government must have a strong civil government network, firmly grounded in the rule of law, enabled by effective roads, rail, mass communication and telecommunication infrastructures. Additionally, the government must be able to focus on specific areas to gain intelligence on terrorist/insurgent activities and be able to rapidly apply force where necessary to counter their operations and reduce their level of control. The challenges for security are the same as for control. India must have a baseline civil police and para-military infrastructure, and the ability to provide additional force when and where necessary. This will require a robust communications infrastructure
integrating civil and military command centres to provide rapid warning when certain elements of the population are threatened. Additionally, forces must be organized and equipped to effectively respond to any threat. In India’s case, rapid and long range mobility will be essential to make this possible. Many segments of the Indian population suffer extreme poverty, with little hope of improvement in the near term. Areas where poverty has reached crisis levels are susceptible to manipulation by terrorist/insurgent organizations.

The Indian government must be aware of such areas and be able to provide assistance in a responsive manner, while economic development efforts continue. Once again, rapid, responsive, long range mobility will be essential, something that air power offers as long as assets are available. The cultural, religious and language diversity of India is staggering. It is easy for smaller sects to feel culturally or ideologically isolated from the government. Terrorist/insurgent organizations frequently take advantage of this to widen divisions and sponsor internal conflict. Additionally, in most cases the non-state actors in India are Indian citizens – not foreigners. Therefore, they identify better with the civil population and derive greater legitimacy. Here again, robust lines of communication between the centre of Indian government and each community are essential, along with a well developed education system.

Historical Pointers & An Indian Perspective

The first four decades after WWII mainly saw the employment of ground forces to combat insurgencies and guerilla movements that stretched across the globe from Vietnam, Jammu &Kashmir, Kurdistan and Gaza in the Middle East, to Ireland in Europe. Except for the rather aimless offensive employment of air power by the US in Vietnam and the effective use of air power against the Malayan insurgency, air power in other places was mainly used only in supporting roles. It was the Israelis who realized the potential of air power as a
powerful tool of the state when faced with a literal struggle for survival as a state in the late eighties. The Israelis were also amongst the first to use air power in conjunction with Special Forces to conduct anti-terrorist operations during the famous Raid on Entebbe. Since then, air power has been used offensively by Turkey against Kurdish insurgents, by Russia against the Afghan and Chechen rebels, by US and coalition forces in Kosovo, Afghanistan and Iraq, by Sri Lanka against LTTE, and most recently, by Pakistan in their drive against the Taliban in SWAT. The use of airpower by India in Kargil does not typically fall under the use of air power against non-state actors, but falls under the use of air power at the lower end of the spectrum of warfare that lies on the fringes of 4GW by virtue of the mix of regular troops and foreign terrorists who made up the infiltrating force that occupied the icy heights of Kargil.

The advent of precision weapons and advanced aerial and space based sensors to create ‘unblinking situational awareness’ has given the state an additional and viable military option provided it can handle intense media and international pressure related to collateral damage and civilian casualties. Whenever offensive application of air power has been followed by clinical ground operations, the non-state actor has been pushed to the verge of defeat. However, whenever attempts have been made to defeat a non-state actor by using only air power, nation states have been less than successful. In all this debate, the non-kinetic and support roles of air power continued to be extremely relevant in the war against non-state actors. From a purely Indian perspective, the hue and cry in the media over the IAFs request to fire back in self defence when fired upon by Naxals is perplexing to say the least. There seems to be a feeling of disbelief that the Indian state can even think of such a thing.

Have we forgotten the effective use of airpower in joint operations against the Mizo insurgency in the mid- sixties? In Feb 1966, two Mi-4 helicopter squadrons were tasked to airlift troops from 18 Assam Rifles, 2/11 Gorkha Rifles, 8 Sikh and 5 Para to relieve and reinforce the Aizwal garrison
that was being threatened by well trained cadres of the Mizo National Front (MNF) who had surrounded the treasury and five other posts nearby. The initial attempts to heli-land the troop were met with fire from the MNF cadres and had to be aborted. A Caribou transport aircraft of the IAF on a recce mission over Aizwal was also shot at and damaged. Without wasting much time, a decision was taken at HQ Eastern Army Command that was headed by then Lt Gen SHFJ Manekshaw to request HQ Eastern Air Command to provide armed escorts to the mission. Following this, all waves of helicopters were escorted by four Toofani jets that strafed and fired rockets at the MNF positions and gave covering fire while the troops disembarked and forced the MNF to retreat. On following days too, Toofanis and Hunters operating from Kumbhigram and Jorhat airfields in Assam continued to independently target MNF positions. Little known is also a fact that the first serious attempt at executing Special Heliborne Operations or SHBO was attempted by 5 Para along with Mi-4s of 110 Helicopter Unit in the Mizo Operations. These operations successfully intercepted MNF cadres on the move and introduced an element of speed and urgency in the operations, something that has become so essential in today's anti-naxal ops.

Moving away from India but staying in South Asia, the turning point in Elam –IV, the last war between the LTTE and the Sri Lankan armed forces was when the Sri Lankan Air Force (SLAF) effectively targeted LTTE leadership, killing many of them, injuring some and forcing even Prabhakaran to change his location on a daily basis. Coupled with this was the synergistic targeting of Sea Tiger assets by the SLAF and Sri Lankan Navy that choked the LTTE completely. Ironically, the dominance of the Sri Lankan Army has resulted in very little public credit being given to the SLAF for the victory against the

94 Ibid
95 Sea Tigers was the naval element of the LTTE.
LTTE. All recent successes against the Al-Qaeda leadership in Iraq, Afghanistan, Pakistan and Yemen can be attributed to effective targeting by coalition air power. Similarly, the Pakistan Air Force has successfully targeted the Taliban in SWAT, FATA and South Waziristan with Cobra helicopters and fighter aircraft, albeit with some collateral damage. Keeping the Indian template as the Mizo operation, our airpower utilization in anti-naxal operations is likely to be far more restrained, calibrated and defensive in nature, the aim being to first send a coercive and deterrent message before engaging in any kind of offensive operations. Hopefully, this should sow the seeds of doubt within the movement that if pushed further, the state would not hesitate to respond aggressively, and hasten a negotiated settlement.

Adversary Feeders in India

Non-state actors require the basic feeders of people, material supplies and information to sustain operations for legitimacy. In India these feeders translate to several specific centres of gravity.

- **Leadership.** Terrorist and insurgent leaders in India are generally selfishly motivated. They are well integrated with the local population and identify well with them, giving them considerable legitimacy. As a result they are difficult to find, and once found, they are difficult to target without significant collateral damage. Overt attacks on leadership are likely to cause a backlash among the surrounding civil population. Therefore, targeting of leadership may not always be a viable option in the Indian scenario. However, it must be remembered that this option remains with the highest pay-offs in terms of breaking the back of any terrorist or insurgent movement. Technology and precision facilitates this mission and once India acquires the requisite capability, it must go after terrorist leadership by targeting them from the air just as the coalition
forces have done effectively done against Al-Qaeda and Taliban leadership.

- **Motivation/Morale.** Terrorists/insurgents are highly motivated, with firmly entrenched ideology. Except for the top leadership, most cadres are generally less educated and could have been systematically indoctrinated since childhood. As a result, it is difficult to change their ideology and motivation in any time less than a generation. Hence, only a sustained political effort can address this problem. However, air power can be applied to facilitate this political effort and provide the stability required for it to continue.

- **Popular Support.** As mentioned, leadership generally enjoys local popular support due to the high degree of identification they have with the people. Even though the people may not be directly involved in operations, they provide material and moral support as well as security for the terrorists/insurgents. Military strike operations could only decrease the legitimacy of the government with these people. However, air power still has a role in improving the awareness and presence of the government within these populations. This in turn enables the government to connect with the population and build its relative legitimacy over time.

- **External Aid.** Indian terrorist/insurgent organisations are highly dependent on external aid. This feeder is dependent on their capability to communicate and move money, technology, weapons, manpower and other items into and out of India. Airpower can play a number of roles in stemming this flow, in terms of reconnaissance, interdiction and the movement and coordination of security and police forces.

Analysis of the above centres of gravity yields several critical vulnerabilities and associated targets. Air power is one of many elements that must be applied together against these vulnerabilities. Some of these are listed below:-
- Terrorist/insurgent leadership- their legitimacy, physical security and freedom of movement.
- Isolation of civil population who are providing recruits and support, in terms of information, physical movement and economic sustenance.
- Terrorist/insurgent training camps and operating bases.
- Terrorist/insurgent lines of communication.

Air Power Roles in Small Wars in India

Airpower can play several specific roles in bolstering government legitimacy, while interdicting terrorist/insurgent feeders. It is important to emphasize here that in such cases air power can and must be used in more than the traditional combat roles to attack these vulnerabilities. Flexibility of thought is a prerequisite for exploiting the flexibility of air power in small wars. *Aerial reconnaissance* will play a key role in tracking terrorist/insurgent activities and identifying operating bases, training camps and supply nodes. Visual, photo, satellite, and UAV reconnaissance, will be significant in this effort. Dense vegetation and mountainous terrain complicates aerial reconnaissance. However, advances in systems and techniques will make air power more effective in this role. Key capabilities for effective aerial reconnaissance will be increased loiter time with good survivability, day-night capability; high resolution sensors that can be cued by search platforms; near-real time data link to other sensors, command centres and weapons platforms; and advanced multispectral systems with corresponding processing algorithms. Air power can provide critical intelligence and *electronic attack (EA)* capabilities in support of feeder interdiction. Electronic Support measures or ESM can be used to identify terrorist/insurgent lines of communication and operating bases, as well as locate key leaders, even across international borders. Intelligence gained from adversary communications can be used to direct operations against them.
Additionally, incriminating terrorist/insurgent communications can be publicized to undermine their legitimacy. EA can be employed to disrupt adversary communications and cause confusion. It can also be used to interdict insurgent communications to civil populations where appropriate. EA will also be important to ensure security of friendly force operations. Key capabilities will be flexible collection platforms with direction finding capability and long loiter times; advanced signal analysis and correlation systems; advanced signal decryption systems; rapid communications intelligence processing capabilities; near-real time data link to other sensors, command centres and weapons platforms.

**Mobility and responsiveness** of air power are perhaps the most significant contributions that air power can bring to 4GW. Air mobility gives the government a ‘virtual presence’ capability, in which a small reaction force can effectively respond to a large geographic area. With air transport, ground security forces can be rapidly concentrated when and where needed, in many types of terrain. Military air power can also be used to transport police and other civil security elements in response to crisis. Furthermore, it greatly enhances the speed and reach of humanitarian relieve and civil support operations, all of which supports government legitimacy and reduces adversary influence. Key capabilities will include flexible transport platforms with sufficient range and the ability to operate from small landing strips or zones; fully developed communications infrastructure allowing rapid coordination within the military as well as with key civilian agencies; integrated civil – military command and control processes; and a systematically developed nation-wide infrastructure of landing strips/zones and maintenance facilities.

**Attack helicopters** will be just as relevant, and just as vulnerable, in future small wars as they have been since their introduction. They provide a significant reconnaissance and on-call fire support capability that can be a tremendous force multiplier. Such platforms can be used in support of civil security forces,
quick reaction forces or larger operations. They can also be used as an escort platform for military or civil ground movements, including humanitarian relief convoys. Low speed, low altitude and smaller munitions mean attack helicopters can be employed for strike operations with reduced risk of collateral damage. Key capabilities will include enhanced self defence systems to increase survivability; improved day-night capabilities; advanced target acquisition systems; smaller, more precise weapons; near-real time data link for passing and receiving target data; and flexible command and control systems and structures that incorporate civilian agencies for integrated civil-military operations.

Though punitive strikes by multi-role combat aircraft may not be a very viable option in the Indian context, it is important that the IAF has to be prepared for this role, should the political leadership need it any time. Targets for punitive strike would mainly be training camps or the leadership. Fighters would be the best platforms for executing this mission across the border, and the attack helicopter would be best suited for attacking leadership nodes. The importance of real time intelligence cannot be understated, as these targets are not static. In order to avoid collateral damage in such attacks, precision attack capability would also be required.

Though Casualty Evacuation is one of the non combatant roles of air power, it is going to play an important role in small wars. Tolerance for loss of human life in a small war is typically lower than in a full-scale conventional war. Rapid medical evacuation will greatly increase the survival rate of combat injuries. It can also be used to move doctors, civilian or military, around the region, and get civilians to medical care. This again contributes to government legitimacy, but presently does not seem to be a key result area even in our existing conflicts. Air power can also be employed in many ways not traditionally considered in conventional wars. The dynamic environment of small wars demands imaginative use of all resources to achieve greatest legitimacy and interdict non-state actor feeders. An example of creative use of
air power is in the field of information operations. Frequently, terrorists and insurgents place great emphasis on getting their version of the 'truth' into the media before the government, undermining government credibility. In some situations, it is appropriate for the government to establish a quick launch press corps with a military security element that could be sent on short notice to the scene of significant events and allow the real truth to be published before the adversary broadcasts a twisted version. Military, civil agencies and secular press would have to closely coordinate to make this possible. Such an organization would break the mould of current military doctrine, but could be tremendously effective in the real small war struggle for legitimacy. Military aircraft could also be used to transport supplies for an NGO into a remote location, provide genuine assistance to the population and enhance popular support for the government. Alternatively, the military could provide a sortie periodically to allow civilians to sell products outside of the local area, enhancing their economic status and aiding in building connections with central authorities. Conventional minds will view such non-standard uses of military aircraft as a waste of government resources, but the benefit can have a significant impact in the contest for legitimacy – and save military resources in the long term. Current air power doctrine of the IAF governs the force structure and deals primarily with conventional wars against well defined adversaries. It does not sufficiently address small wars. Doctrine, structure and procedures should be refined to cater for small war situations with specific mechanisms to allow for effective integration with civilian efforts and parallel lines of operation (LOOs).

Naxalism & Airpower

The term Naxalism, comes from Naxalbari a small village in West Bengal which witnessed a violent uprising in 1967. After an initial surge in the early 70s the movement was suppressed with force. It resurfaced in the eighties with
the formation of the People’s War Group (PWG), the most formidable Naxalite formation in the country today along with the Maoist Communist Centre (MCC). One of the reasons why naxalites\(^{96}\) have attacked the Indian paramilitary forces with impunity and great success is because they realize that domestic political compulsions have ensured that the armed forces are kept away from fighting an insurgency that is rapidly spreading in the hinterland of India. 165 of India’s 600-odd districts across six states have now been officially declared “Naxal affected”. The red corridor shown in Fig 7.1 on the next page depicts the naxal corridor spanning across the states of West Bengal, Bihar, Jharkhand, Orissa, Chhattisgarh, Maharashtra and Andhra Pradesh.

![Naxal affected areas in India](image)

**Fig 7.1 - Red Corridor depicting Naxal Spread\(^{97}\)**

\(^{96}\) Naxalism is a term used to describe a Maoist insurgency that prevails in some states of India.

\(^{97}\) [http://krantikarinepal.blogspot.com/images/naxalite_map_india.gif](http://krantikarinepal.blogspot.com/images/naxalite_map_india.gif), accessed on 12 Feb 2010
The armed forces in general have been chary of joining the fight against the naxals because they are already overstretched in J&K and the North-East. The IAF too is heavily committed in the same areas and does not have the resources to significantly influence operations against the naxalites. Another interesting aspect that has seldom been understood is the demographic nature of Naxalism vis-à-vis other insurgencies worldwide. In most other countries insurgencies have grown on geographical peripheries where insurgents have aspirations of independence and have had support from ethnically similar regions in neighbouring countries. Typical examples are the Kurdish rebellion in Iraq & Turkey, the ethnic strife in the Balkans, the Chechen rebellion and to some extent, the Islamic unrest in the border province of Sinkiang in South-Eastern China. In India too, the insurgency in the North East and the proxy war in J&K have received tacit support from meddlesome and ethnically similar neighbours. In such situations, it is not difficult to rationalize and motivate regular troops and airmen to fight the insurgencies as they visibly threaten national security. The Naxalite movement however is an insurgency that is spreading in the hinterland, with the same regions being represented in the armed forces. Whether this would be an impediment when it comes to having to join the fight against Naxalism is something that needs to be kept in mind by the govt and policy makers. The rise of Naxalism may not have been spectacular, but its steady consistent growth cannot be denied and needs to be analysed in its right perspective. The Naxal movement continues to persist in terms of spatial spread, intensity of violence, militarisation, consolidation, ominous linkages with subversive groups and increased efforts to elicit mass support. The Naxalites operate in a vacuum created by the absence of administrative and

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political institutions and seek to offer an alternative system of governance through the barrel of a gun.

The stakes have recently been raised with the firing by the Naxalites on an IAF Mi-8 helicopter on 14 Nov 08 in the state of Chattisgarh\textsuperscript{99}, resulting in the death of a flight gunner and significant damage to the helicopter. The event is significant in the sense that the escalation has been initiated by the non-state actor just as the LTTE did during the ongoing Elam War-4 that is approaching a critical stage. The firing on the IAF Mi-8 helicopter indicates that the naxalite movement is willing to raise the stakes in its ongoing insurgency against the Union of India. This incident re-opens the debate on the use of offensive air power against a non-state actor within the confines of one’s own geographical boundaries. Numerous encounters in J&K between the security forces and terrorists have led to needless loss of the lives of security personnel because of the understandable caution with which they have gone about the encounters, particularly in relation to collateral damage and escalation control. Without getting to specific encounters in J&K, a few of which have had the potential to employ air power offensively with armed helicopters, excessive caution and restraint have resulted in the death of officers and men. These could have probably been avoided if armed helicopters were employed after ascertaining the low probability of collateral damage. Typical examples of these have been the storming of Bakarwal huts\textsuperscript{100} by the Indian Army in the higher reaches of J&K where no civilian population lives for miles. The question we need to ask is that are we portraying the image of being a ‘soft state’ in our prosecution of war against the non-state actor? Are we also displaying a marked inability to synergize our capabilities against elements that threaten the legitimacy of the state? If non-kinetic air power has to be used effectively and safely in a hostile

\textsuperscript{99} Times of India, New Delhi15 Nov 08,p.6.

\textsuperscript{100} Bakarwal huts are huts used by roving shepherds who set out from villages in the lower reaches of Kashmir in search of pastures for their flocks of sheep. These huts are generally abandoned in winter and are known to be used by infiltrating terrorists from Pak Occupied Kashmir as hiding and gathering places prior to spreading out into the lower reaches.
environment within our own territory, it is essential that all elements of state apparatus must support the mission from conception to execution. Without misinterpreting any facts, the IAF needs to be a trifle alarmed that the Naxals are now targeting them and initiate suitable measures to avoid recurrence of such incidents.

Case Study of A Typical Naxal Attack

It is important to study a typical Naxal attack and correlate it to a situation wherein air power assets were readily available for use in various roles, both supporting and offensive.101 On the night of 13 Nov 2005, a group of approximately one thousand naxalites converged onto the town of Jehanabad in Bihar, approximately 30 kms from the capital city of Patna. Their target was the district jail, which housed about 250 inmates including many of their leaders. Their timing was perfect, since most of the police force was deployed elsewhere in the state for election duties. The police had about a day’s advance intelligence input of an imminent attack and had taken minimal precautionary measures as they underestimated their opponents. However, the sheer magnitude of attack surprised everyone and the prepared defences were rendered totally inadequate. After building up the force on the outskirts of the town, the naxalites launched a three-pronged simultaneous attack on the district jail, police station and the police lines. Within an hour of the gun battle, the Naxalites were able to overrun the defences and free all the inmates of the jail. The attack left 15 policeman dead, numerous injured, besides the loss of weapons from the armoury at the police station. By daybreak, the naxalites had fled and melted into the nearby forests.

101 Taken from a presentation made by Air Wing student officers of the 62nd Staff Course at DSSC Wellington in Sep 2006 on 'The Employment of Air Power in Small Wars'
How could air power have helped in this situation? For this let’s go over a hypothetical situation wherein adequate airpower assets and a suitable command-control set up was available for the forces when this incident occurred. In time frame, let’s see how the situation would have developed. After having received an initial intelligence input of an imminent attack on 12 Dec 05 the civil administration could have alerted the crisis management group at the state capital, Patna. The state in turn could have called for air assets, initially in the form of UAVs to step up surveillance in the area along with medium lift helicopters to transport specialized anti-insurgency para military forces into the area. All this could have been achieved on 12 Nov itself with a UAV control station in operation by the afternoon on Day 1 with UAVs operating from Patna airfield. Initial sorties could have been flown by the UAVs on 12th evening. These sorties would have established topographic details, likely entry points into the town, and identified vantage points for security forces in the expected area of operation. The morning of 13th Nov could have seen the identification and airlift of specialized para-military forces with limited night fighting capabilities into Patna. The forces would have been briefed and kept on a 30 minutes ‘hot standby’. By the evening of 13th Nov, UAVs with live streaming capability via data links could have noticed Naxalite build up in the vicinity of Jehanabad. This would have been the trigger for insertion of troops around last light. The naxalite attack could have easily been repulsed with ambush positions cutting off escape routes. By midnight, majority of the insurgents would have either been killed or captured, inflicting a significant blow on the movement. A few escaping militants could have possibly been tracked to their hideouts opening the possibility of further strikes by para-military forces. This would have been the culmination of a successful anti-naxal operation in which air power could have been employed with telling effect in non-kinetic roles.

More recently, on Apr 17 2009, an IAF helicopter flew numerous sorties in a rescue mission that evacuated more than 200 villagers from Malkangiri, a
naxalite infested area of Orissa.102 The headlines on the front page of The Indian Express of 23 May 2009 read ‘In the midst of polls, AirForce airlifted a village under Naxal fire’ it went on to highlight the operation by saying ‘as encounter raged on in Orissa, IAF rescued 240 villagers and an EC observer’. The underlying message in this operation points at the capability of air power to influence the war against Naxalism, albeit in a calibrated manner. As discussed in the theoretical portion of this research in Chapter II, parallel lines of operation is the only way to defeat the non-state actor. In this particular situation an election commission was furthering the democratic cause of conducting peaceful elections when the Naxalites struck. The CRPF (Central Reserve Police Force), a para-military force tried to beat back the attack, but found itself being outnumbered and outfought by the Naxals. This is when IAF help was requisitioned and a MI-17 helicopter flew multiple missions to evacuate an entire village. This operation would have sent home a message that the state is getting its act together and needs to be followed up by incremental increase in the employment of air power to win over the affected population.

Airpower in Anti-terrorist Operations

Since the Entebbe operation in which Israeli commandoes were stealthily airlifted into Entebbe airfield, to the recent low scale slithering operations conducted by the Indian NSG during the Mumbai terror attacks and the Israeli strikes against Hamas leadership in Gaza, airpower has been employed against terrorists in all possible roles with mixed results. The impediments in employing offensive air power in anti-terrorist operations are many and a clear understanding of these are important for various tiers of state machinery that include bureaucracy, police, paramilitary forces and a wide cross-section of the military itself. Use of offensive airpower against terrorists in sparsely populated

102 Manu Pubby, Indian Express, New Delhi, May 23, p.6
or under-developed terrain is a viable proposition with the US led coalition forces employing UCAVs, attack helicopters and fixed wing fighter aircraft in Afghanistan against the Taliban. Use of offensive or kinetic air power in urban terrain is a completely different exercise that is dictated purely by political constraints and compulsions coupled with humanitarian issues that relate to collateral damage. The Israelis in Lebanon and Gaza, the US led coalition in Iraq and the Sri Lankan Airforce against the LTTE have used offensive airpower with varying degrees of success in urban terrain, but faced severe strictures from the international community for excessive collateral damage and loss to civilian life. However, use of offensive airpower does have have a significant deterrence value and coercive effect on terrorist leadership and nations have to take a tough call on this based on national security imperatives.¹⁰³

For the time being however, nation states like India prefer to employ the non-kinetic or supporting roles of air power in anti-terrorist or even anti-insurgency operations that mainly include surveillance by UAVs, logistics and communication support by transport aircraft and helicopters and insertion of Special Forces into operations in hostile environment.

TECHNOLOGY IN 4GW

No study of the application of air power in 4GW would be complete without considering the impact of emerging technology in areas, of intelligence, sensors, precision weapons, advanced aircraft design and electromagnetic dominance.¹⁰⁴ 4GW is generally characterized by difficulty in finding, identifying and isolating targets, whether operating in urban terrain, mountains, caves or forests. Intelligence sensors can be broadly classified as wide area surveillance assets

¹⁰³ Raman, B, Terrorism Yesterday, Today & Tomorrow, New Delhi, Lancer, 2006,pp.3-6.
and close target reconnaissance assets. Wide area surveillance assets provide information about overall picture of the target and also help in identifying the locations within the target area that require more intensive investigations. The following technologies can enhance wide area surveillance capabilities in context of small wars & 4GW: -

- **Foliage Penetration Synthetic Aperture Radar (SAR) and Moving Target Indicators (MTI).** A severe limitation exists among most present imagery sensors in their inability to see through heavy foliage. Recent developments in foliage penetrating SAR and moving target indicators (MTI) are making it increasingly possible to conduct wide area surveillance even in regions of heavy foliage. Although these capabilities are still in early stages of development, they will eventually have the potential to significantly enhance the quality of intelligence gathering, thereby improving the effectiveness of air operations. 105

- **Multispectral and hyperspectral Sensors.** Single waveband sensors have less fidelity than multi and hyper spectral sensors. Advances in sensors and processing algorithms using a broader range of frequencies of electromagnetic energy are making possible remote examination of objects with greater fidelity than ever before. 106

- **Chemical Sniffers.** Miniaturization technology has made it possible to build small, mobile chemical analysis laboratories that are able to ‘sniff’ or detect traces of certain chemicals in the atmosphere. Low flying aircraft or ground vehicles equipped with these devices will potentially be able to highlight places where bomb factories, arms caches or potential suicide bombers might be operating. Miniature UAVs carrying

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106 Ibid
spectrometers can be deployed over areas of concern to collect samples or 'chemical signatures' for further processing.  

- **Microelectromechanical (MEM) devices.** MEMs are microscopic devices in which sensors, transmitters, receivers or actuators have been miniaturized to the size of a transistor. These devices are being constructed to detect a variety of visual, thermal, acoustic and biochemical phenomenon. These can be effectively used in small war scenario thereby quality of intelligence collection.  

Close target reconnaissance assets provide detailed information about a specific target. New close target sensor technologies with a potential impact on air power are as follows:-

- **See through walls.** Conventional cameras cannot see through the walls of a building. If the occupants are cautious and it is not possible to plant the device inside the building there has been no way to collect information on them. But new radars having the capability to see through the walls of a building can determine with modest resolution whether the building is occupied or not. This information can be an important for planning an attack.  

- **Facial recognition system.** This is an emerging technology developed to identify individuals in a crowd. Complex algorithms scan images for a signature set of features that match a targeted individual. If cameras are placed in areas where terrorists or other key individuals are likely to pass then the images collected from these cameras can be compared against a database of facial images and other physical features, with an amazing degree of accuracy. This has the potential to revolutionize the way targets are located, monitored and attacked.

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107 Ibid
109 Op Cit, Ochmanek. p. 131-133
110 Ibid
Command and Control.

4GW invariably involves potential targets like terrorists who mingle freely with the civil population. Engagement of these potential targets requires a flexible and responsive command and control system to link the ‘finders’ with the ‘controllers’ and the ‘shooters’. New developments under the name of ‘dynamic engagement control’ link shooters with control centres provide a comprehensive picture of the battle space. Tactical controllers can be incorporated as necessary for proper weapon controlling. Although not new, GPS can greatly enhance the ability of controllers and aircrew to locate targets quickly and with great precision. New developments in geo-location systems are refining accuracy and speed, making target. Secure and effective data link communication between controller and shooter continues to advance, facilitating efficient attack operations by eliminating several potential sources of delay. JTIDS (Joint Tactical Information Distribution System) allows secure digital exchange between aircraft and control centres on relative positions, target locations, weapon availability, fuel status, and other information, thereby reducing the need for intra flight voice communication and increasing overall situational awareness. Other systems like data fusion software, interlinked but physically dispersed databases, and large scale communication nets also enable precise application of a network of sensors and weapons systems for swift and effective target engagement. 111

Precision Weapons

Weapons development on two fronts is particularly relevant to the utilization of air power in 4GW. Firstly, aerospace weapons are becoming increasingly

accurate. Secondly, as accuracy improves, weapon developers are able to
decrease the lethal radius of weapons, reducing collateral damage and refining
weapons effects. LGBs are old news now, but systems are increasingly accurate
and capable. Current circular error probable (CEP) achievable by LGBs is
approaching to within several meters. Joint Direct Attack Munitions (JDAMs)
exploit GPS and bomb guidance units to enable bomb accuracies of a few tens
of meters in any weather condition against targets beyond visual range with
accuracies continuing to improve. Small Diameter Bombs take advantage of
increased accuracy to reduce the amount of high energy (HE) explosive by half
or more, enabling precise targeting with reduced collateral damage. Several
concepts and variants are in development. Smaller bombs also mean
conventional airframes can carry more weapons and small airframes, such as
UAVs can be used to more lethal effect.\(^\text{112}\) Several new weapons concepts are
being tested for application against small targets in densely populated areas.\(^\text{113}\)
Amongst them are Kinetic energy weapons, which are small, dense, high-
velocity projectiles with little or no explosive material, LASER guided grenades
capable of homing on LASER energy and Non lethal directed energy weapons
(acoustic, LASER, microwave) that disable without killing.\(^\text{114}\) Small UAVs
specially designed to carry weapons are also being developed for the small and
urban war. Nano-energetics is a field of nanotechnology\(^\text{115}\) that is being
developed with applications toward building smaller but more lethal weapons
such as ‘cave buster bombs that have several times the detonation force per
pound munition than that of a conventional bomb. Over the long term this will
allow small UAVs to carry large numbers of highly effective weapons.\(^\text{116}\)

13 Jan 2009
\(^{113}\) ibid
\(^{115}\) ibid
Over and above conventional recce platforms, Aerostat systems provide cost effective wide area surveillance and detection with a fraction of the manpower required by other methods performing the same mission. Such systems make it possible to monitor activities along a border or around a critical node for long periods of time, denying adversaries the freedom to operate in that area. In the final analysis, technological advances have increased the utility of aerospace power in small wars. But at the same time they have placed much greater capability in the hands of potential adversaries.