OFFENSIVE AIR POWER IN THE HIGH MOUNTAINS

R.G. BURLI

We share a long high mountainous border with China to our north/northeast and with Pakistan to our north/northwest. Historic alignments against India, along with the recent agreements between China and Pakistan on the modernisation of transport corridors, development of a new oil route and expansion of Gwadar port, etc should be a wake up call from the security perspective. Despite recent progress in economic cooperation, China has not softened its passionate territorial claims in India. To this day, it lays open claim to almost the entire area of the Indian state of Arunachal Pradesh. Water security through control of the mighty Himalayan watersheds may be as much the reason as pure territorial aspirations. Military preparedness in personnel, equipment and training is a necessity and China must feel compelled to perceive it. India must never doubt its intuition that China, despite being a potential long-term economic ally, would need to be deterred from ill-conceived military adventurism. That Pakistan needs to be deterred likewise is obvious.

As the succeeding text will endeavour to reveal, unlike India's perhaps wrongly conceived holding back during the 1962 War that resulted in a comprehensive and humiliating defeat, the key this time round should clearly be aerospace power.

This work examines the various facets of the application of offensive air power in the zone of joint physical engagement of a high intensity conflict situation with China, with a specific eye on operations in the Arunachal Pradesh region.

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LIKELY SCENARIO

Economic compulsions and nuclear threshold considerations could see international pressure mounting quickly on belligerents. In this scenario, operations would most likely be characterised by rapid movement with in-situ forces or those mobilised rapidly, coming into action in a quick timeframe with the intention of occupying territory as quickly as possible albeit under the restricting circumstances of terrain and environment.

The Indian land forces, despite being well prepared, are at somewhat of a disadvantage in terms of optimum positioning. They might want to thwart the Chinese endeavour by planning to stop the onslaught while keeping options open for a counter-attack at an appropriate space and time to capture Chinese territory towards using as balanced give and take after the hostilities. The Indian Air Force's (IAF's) air power could in such an instance, be expected to operate complementarily across a fairly wide area with alacrity.

A future Indo-Pak scenario could prove to be another series of insidious low intensity conflict operation (LICO) situations, perhaps akin to repeats of Kargil. A typical future Indo-Pak round could occur perhaps in the context of the Siachen Glacier. The ongoing Indo-Pak confidence-building measures (CBMs) might result in it having to be vacated by the Indian Army. Going by past experience, Pakistan would almost certainly renege on its commitment and occupy the Saltoro heights.

Whatever the case, if we could prepare, equip and train with modern capability to counter a high intensity war situation in the high mountains with China, the same means could be applied in a modified, perhaps scaled down sense, to defeating a LICO level military confrontation in the mountains with Pakistan in the Jammu and Kashmir (J&K) region.

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To make this possible, it seems almost certain that an offensively oriented modern aerospace force would be a prerequisite. Conduct of parallel and synchronised operations would be essential. Offensive aerospace power applications would need

to be stitched seamlessly with tactical operations through detailed advance joint planning and training. All traditional air operations, including the gaining of the requisite control of the air through appropriate offensive and defensive counter-air operations (CAO) and inflicting the required level of systemic damage through a resolute interdiction campaign (were the opportunity to occur) would need planning and execution.

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RECENT HISTORY

An examination of relevant history would reveal that other than to some extent in recent years, air power has had few precedents of truly effective application in the mountains. The Sino-Indian War of 1962 might have been a useful proving ground, but for the fact the IAF's offensive arm was kept grounded due to concerns of inordinate escalation of the conflict.

Soviets in Afghanistan

During the Eighties, the Soviets rediscovered why Afghanistan's harsh mountainous geography and harsher climate has made it difficult to conquer and occupy. As has been their wont, the Afghan fighters, pressed by the Soviets, retreated into the high mountains where Soviet tanks could not follow.

The Western powers and the Islamic states provided support to the Afghan resistance. The Soviets relied on special forces and air power to achieve a military solution. Selected conventional forces attacked resistance strongholds and air assaults attempted to envelop retreating insurgents. These units were light enough to be as mobile as the resistance itself. Yet they could call in tremendous firepower in the form of Soviet

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air power. These new tactics were initially effective and the Soviets might have been on the verge of defeating the resistance. But the induction of American man-portable surface-to-air missiles like the Stinger resulted in large numbers of aircraft in general and helicopters in particular, being lost. This made the Soviet tactic of surrounding the Afghan fighters through offensive air power ineffective and prohibitively expensive. The Soviets, unable to adapt to this new threat, ultimately lost the air war. This permitted the resistance to revive and the Soviets had to ultimately withdraw from Afghanistan.

Operation Allied Force, Kosovo

A part of Operation Allied Force, a post-revolution in military affairs (RMA) era air campaign, was conducted in the mountains bordering southern Kosovo against Serbian forces close to Albania and Macedonia. Precision guided munitions (PGM) including laser guided bombs (LGB) and joint direct attack munitions (JDAM) were employed during the campaign, sometimes against insignificant and highly mobile targets. Individual tanks had to be attacked in some instances. This was done fairly successfully with PGMs from great stand-off ranges. Weather hampered air operations on several occasions. During these times, being immune to weather, the newly introduced inertial navigation–global positioning system (IN-GPS) JDAM proved effective against pin-point attacks. The air commander, Gen. Short, operated under severe constraints in the theatre command chain, including a cumbersome and time consuming decision chain that was routed through the theatre commander (US Army Gen. Wesley Clarke) all the way back to the highest political echelons of mainland USA. Aerospace power, hence, turned out straightjacketed and incapable of being applied efficiently by commanders not well oriented to perceiving its nuances. A painful lesson was re-learnt.

However, from an expert perspective, the campaign endorsed the effectiveness of network-centric warfare (NCW) as a force multiplier, use of PGMs like the JDAM and the unmanned aerial vehicles (UAV) in the reconnaissance surveillance and target attack (RSTA) role. These were developed upon further and greater effectiveness was achieved during Operation Enduring Freedom in Afghanistan a few years later.

Operation Anaconda

In a way, Operation Anaconda, a subset of Operation Enduring Freedom can perhaps be termed as a recent example of reasonably effective application of air power in the high mountains. Pursued by the Coalition forces, the Taliban and Al Qaida cadres retreated into the sanctuary of the labyrinthine caves of the Hindukush Mountains of south Afghanistan as they had done against the Soviets at an earlier time. Operation Anaconda was launched to force these cadres out of their mountainous hideouts. It started off with quick response ground forces trying to do the job single-handedly. But the ploy failed and only when casualties mounted a month after it began was offensive air power called in, almost as an after-thought. Special operations forces (SOF), along with expert tactical air controller (TAC) teams promptly went into action, calling in and directing massive air power in the mountains from large stand-off altitudes and distances. Both PGMs and free-fall bombs were used. JDAM and other ordnances, including thermobaric munitions, were employed. Satellites and UAVs like the Global Hawk and Predator were deployed for persistent intelligence surveillance reconnaissance (ISR). The Predator was also used for precision attack with the Hellfire missile and proved effective in reducing the sensor to shooter timeframe in engaging time sensitive targets.

Novel use of air power enabled use of offensive air power directly at the operational rather than tactical level of war.

What was demonstrated in the high mountains of Afghanistan was not classic air interdiction or battlefield air strike (BAS) but rather SOF-TAC team enabled precision air attacks against enemy ground forces with no friendly ground forces in direct contact. This novel use of air power enabled use of offensive air power directly at the operational rather than tactical level of war.

The Kargil Experience

Our own Kargil experience has been reflective of the several abominable errors of the past committed by us as well as other powers. The most glaring of these was a complete loss of initial synergy between air and land forces, brought about

by the late induction into the fray of air power and, hence, the denial of the optimum employment of its attributes of offensive action and shock effect by professionally trained minds, right from the outset. After all, we were fighting a clearly defined enemy within our own territory. There ought to have been no doubt in our collective psyche that we would stop at nothing with regard to what threatens our national sovereignty and territorial integrity. That this attitude dawned in due course of time as operations progressed does immense credit to the professionalism of the armed forces and the maturity of the nation. But had we really learnt from our own earlier experiences or those of others? Clearly not!

Operation Safed Sagar was in parts a post-RMA conflict in the high mountains that in a very general sense, no doubt, featured, on the one hand, the limited use of PGMs, but, on the other, was deficient of some intrinsic RMA attributes, especially those related to communications and networking towards enabling effective operational level command and control. What made up for this deficiency in some measure was that fortuitously it turned out to be a localised conflict with virtually no interference from enemy combat air power. Most importantly, it was an operation that displayed in full measure the power of innovation and adaptation that the IAF has been gifted with as an enduring trait by its founding fathers and the generations of personnel that have manned its echelons. The use of airborne laser designation pods as reconnaissance tools for high-resolution imagery and the adaptation of the Mirage attack system for accurate delivery of dumb weaponry from high altitudes are, among others, two 'high visibility' cases in point.

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The LGB attacks on Tiger Hill poignantly demonstrated not only the telling direct effects of PGMs, but also the indirect and more intangible dimensions of their effect on the human mind in the harsh and tenuous environment of the high altitude mountains. The fall of Tiger Hill was succeeded by the almost spontaneous

collapse of the human will, as it were, on the part of the enemy to continue the fight. Hence, it became easier in its aftermath for the land forces to overrun post after mountain post in quick time and succession towards an earlier and favourable termination of the conflict.

Given its history, it ought to be clear that for air power to be effective in the mountains, it would need to be employed offensively, targetting would need to be precise in space and time, and centres of gravity (COGs) would need to be analysed minutely and be value-based. Enhancing the capabilities of available systems through innovation and relevant upgrades and ensuring interoperability of weapons and equipment should bear rich dividends.

To this extent, the environment of potential engagement would need to be examined and understood in the necessary detail.

EFFECT OF ENVIRONMENT ON MEN AND MATERIAL

The Himalayan ranges are high and rugged, with steep slopes. Valleys and passes are usually the only routes that would allow conventional ground movement of men and material at any viable speed and quantity. Avenues of movement in terms of roads or trails would be limited and require extensive effort to maintain and operate. Landslides and avalanches are particularly common in high cold mountains like the Himalayas. These would restrict movement and pace of operations. Once detected, the accurate power of air-launched weapons could significantly slow down enemy forces' movement.

Air transportation, a possible solution to the mobility issue, would be limited by drop-off of machine efficiency at altitude. Apart from reducing payload, it would increase considerably the effort and time to achieve movement of men and material. Winds could get turbulent, with considerable fluctuations in airflow strength and direction, particularly on the leeward side of mountains. Winds, combined with the terrain effects, could produce strain on air crew especially since they would have little margin for error. Helipads would need to be located in vantage areas on ridges or valleys. Once identified, these could be constantly targetted as part of the counter-air campaign. Air mobility by the enemy would, hence, be a very trying task.

We know from our own experiences in Siachen and Kargil that personnel operating in high mountains need to be in peak physical condition. Low temperatures and the rarified atmosphere of high mountainous altitudes are a devastating combination that could bring the fittest of even acclimatised men to a helpless state of inaction. Supply of water and ammunition and the evacuation of the wounded, especially if helicopters cannot land appropriately, could complicate operations. Despite the highest levels of equipment sophistication and capability, the man behind the machine or gun is the key to effectiveness in war. Should he be demoralised or deterred, the war would be as good as won. Even under optimum conditions, shock effect induced by air delivered weapons could result in 'paralysis' of body and mind and cause rapid capitulation. As alluded to earlier, we know this from our own experience in the Kargil War.

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Though the Indian Army has operated light tanks and armoured personnel carriers (APCs) in the Himalayas during both the first Indo-Pak War 1947-48 in Haji Pir and the China War 1962 in the Chushul, mountains are not favourable environments for armour operations, because tanks and machines lose efficiency at altitude. This, along with constraints of free movement in the mountains, renders them unable to optimise mobility and manoeuvre. Off-road vehicular movement would be difficult. Armour and vehicles, if caught in the open could be lucrative targets for air power. Mechanised infantry would suffer the same limitations as tanks. Use of airmobile forces would be difficult. Logistics nodes, and secure landing areas would be an important consideration. Concentration and regroups are likely to occur in valleys. These could prove good interdiction targets for air power.

EFFECTS-BASED OPERATIONS (EBO)

Advances in wide-area, real-time airborne persistent surveillance and battle management systems make it feasible today for air attacks to create physical and

psychological effects that in combination can quickly prevent a fielded land force from being able to function well enough to overrun and occupy territory rapidly.

Further, the fragility of the human body and mind in the testing high mountainous environment would increase the operational level options through effects-based joint operations. Success could be achieved faster and more efficiently with less risk to our surface forces than is possible in operations that depend primarily on attrition and close battle to defeat enemy land forces.

Weapons

An essential part of EBO is an emphasis on weapons as the sharp end of the proverbial air power rapier. Weapons must be conceived to be on target with the greatest of accuracy and in just the right numbers to achieve the desired effect at the opportune time and place of choosing.

So what should we aim to achieve with weapons to ensure effective air-to-ground attack in the high mountains? For one, we should seek accurate attack on enemy men and material, especially mechanical means of transportation towards degrading enemy ground objectives while enhancing our own. Second, we should seek to deter enemy resolve in continuing operations by playing on the human mind by creating a perception of grave danger in movement and towards achievement of an intense psychological perception of defeat in the face of air attack. For both these effects to materialise, precision would need to be achieved. Hence, an emphasis on PGMs would need to be high.

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Large terrain undulations of mountains could mean a magnification of small inaccuracies in conventional weapon aiming. Reduction of circular error of probability (CEP) achievable through PGMs would mean exponentially increasing the probability of a hit. Hence, weight of attack would reduce markedly. While accuracy of attack is an overt attribute of PGMs, defence against

PGM attacks is also increasingly becoming difficult on account of stand-off ranges. Also, given the inherent problems of effective air defence in mountains due to reasons of intractability and elements degrading surface-based human and machine performance, PGMs are capable of achieving a highly magnified projection of even a modest force level.

The intrinsic accuracy and effect of PGMs would permit the basic weapon to be kept small. Therefore, larger numbers could be fielded by a single platform. Also, a given platform could fly at a higher altitude to ensure better stand-off heights from crests and ridges. Such weapons could also perhaps be deployed on smaller platforms like UAVs, conferring them offensive status other than ISR related support functions. Smaller calibre weapons would also reduce collateral damage – an aspect that could be of considerable significance in bettering time-frames for decisions from higher echelons, relaxing ROEs and safeguarding own forces operating in close proximity of the enemy.

Lack of scope for manoeuvre by own surface forces might mean that they are unable to get out of the way fast enough to permit an air attack against a time sensitive target at short notice. Such movement might be unnecessary in the case of attack with PGMs. An intangible but nonetheless significant effect of precision attack would be the adverse psychological impact on the enemy of always being accurately targetted, with no place to hide. Therefore, resolute attacks with PGMs would in so many ways, tangibly or intangibly, prove successful.

The ability to wage a 24-hour battle would be crucial to the success of PGM attacks. The high mountains to the north are prone to rapid changes of weather. Unpredictable weather giving rise to fog and/or clouding in the high mountains could affect electro-optical designated and guided PGMs, including LGBs. In the circumstances, IN-GPS guided munitions could be effective. Like an LGB, the GPS guidance kit turns a standard calibre 'dumb' bomb into a smart weapon. It probably also comes with a lower price tag and is simpler in application.

Use of IN-GPS guided weapons should eliminate the need to disseminate target imagery to attacking air crew, and reduce workload. Apart from the potential for indigenous adaptation, IN-GPS tail kits like the Long Shot, offer not only a cost-effective solution, but enhanced ranges and uncomplicated precision

capability, with the weapons needing no special aircraft interfaces as they can easily be programmed from the cockpit with a hand-held UHF transmitter.

Other PGM capability such as ARMs and TV guided weaponry already available in our inventory or slated for retrofitment would be relevant as the situation and environment demands. However, before theory turns misleading, it must be realised that PGMs would always be limited in numbers owing to cost and deployment considerations. We would always perhaps have, if anything, a stock of dumb bombs instead and that would need to be worked into how effectively we end up utilising them.

In our specific context, where PGMs are not likely to be available in the requisite numbers, either on account of cost considerations or due to non-availability of the requisite technology, both flight path and non-flight path 'dumb' weapons would always have a major role to play in operations. Needless to say, their employment would need careful consideration and planning. The precision in their effective employment, of course, would mean a shift of focus onto the platform weapon aiming system instead of the weapon itself. Current capability as well as long-term retrofit plans for airborne platforms should allow for their effectiveness against area targets such as concentration areas and regroup points in mountain valleys and creation of landslides and avalanches at critical space and timeframes towards destruction and delay of the enemy.

Platforms and Profiles

Conceptually, the emphasis would need to be more on sophistication of weapons and targetting accuracy than on launching platforms. Aerial platforms would need to have navigation and weapon aiming systems to permit accurate aiming of unguided weapons. Some platforms would additionally have PGM capability. Autonomous capability would imply carriage of a targetting pod either by the same aircraft or another in the buddy mode. Should lasing through a ground based PLDS or a UAV be feasible, then the launch aircraft could be kept simpler and only provided the onboard equipment with the ability to intercept the GPS / LGB 'launch basket' accurately at a given height and speed. For more specialised weapons such as ARMs and TV guided munitions, much greater

degrees of sophistication in terms of aircraft on-board systems and weapon interfacing would be needed.

Inevitably, the IAF would always possess a range of combat aircraft to meet these requirements, either singly or collectively. Resources would need to be preplanned and managed judiciously by command staff. Rather than contemplate new and expensive airframes for the purpose, it might be better to plan on conferring retrofit capability in existing platforms. Indigenous endeavour would be highly desirable and could add to further cost-effectiveness.

The airborne threat would be addressed through an offensive/defensive counter-air campaign that could run parallel to the other integrated campaigns. For delivery of dumb weapons, dive attacks should be preferred to level release attacks. During dive attacks, however, the platform itself could be vulnerable in the final phase of attack, which should normally be as close to the target as possible, conducive to self-damage criteria of the weapons delivered and/or safe transition from dive conditions to climb after weapon release. Nonetheless, all aircraft, especially those expected to enter the danger zone of enemy AD in the battlespace, should be capable of minimising exposure time as also enhancing survivability with self-protection suites.

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Some modern multi-role platforms would also be capable of swing-role employment during missions. For example, an air superiority fighter on an offensive air defence mission could contribute equally effectively to time critical air-to-ground targetting to neutralise targets in the battlespace with dumb and/ or precision weapons.

Space and time peculiarities of mountain operations might call for the persistent attack capability of armed UAVs and UCAVs to meet the immediate tasking requirements of surface forces. Long endurance UAVs like the Heron, given a pertinent weapons capability of missiles or small calibre PGMs, could remain in the area to detect and neutralise high value targets of opportunity

more effectively and in a smaller timeframe. This could free up manned aircraft from immediate demand counter-surface force operation missions. Manned aircraft, in any case, have less potential for such long endurance flights on account of the human factor. This could go a long way in reducing the 'sensor to shooter' loop in time critical situations. Satellite communications could confer the flexibility to operate them at low to high altitudes, as the situation merits.

Enablers and Force Multipliers

Irrespective of sophistication levels, there would always be the need to balance the quality versus quantity factor. While quantity cannot be compromised, costs would inevitably mean a limitation in the overall numbers of systems available. No matter what, in pure numbers we would always be on the 'back foot' in comparison to an adversary like China. We would, hence, need to magnify or multiply our potential. The various sensor elements of satellites, AWACS, FRA and UAVs, would need to be stitched together seamlessly by good communications. Shooter platforms in terms of manned aircraft and UAVs among others would need to be integrated with command decision processing for time and space application of customised and effects-based firepower by air commanders.

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Since the success of effects-based joint operations would depend upon efficient control at the operational level, the requirement of dynamic and fused information would be the principal enabler of future aerospace campaign success in the mountains. Communications would need to be secure. In the mountains, conventional communications, though useful, might incur line of sight limitations. Satellite communications could be exploited more effectively in the circumstances. India already has a significant Satcoms capability, which is making rapid inroads in the military realm. This would need to be integrated more extensively with NCW towards effective air power applications in the high mountains.

Real-time imagery and good connectivity would result in the 'kill chain' becoming shorter, along with a substantial increase in target-attack accuracy. Persistent ISR and precision attack should provide the ability to deny the enemy a sanctuary by day and night. Greater use of 'peer down' positioning of sensor capability available in satellites and UAVs would be necessary.

The problem of mountain shadows would inevitably impinge upon the optimal performance of stand-off look down airborne radar of the AWACS and similar systems. Enemy air power could exploit this limitation to conceal approach through low-level ingress into the battlespace. Though not the easiest of tasks to operate close to high mountain surfaces on account of piloting problems, weather and loss of efficiency, this loophole would need to be compensated through suitable joint deployment of lightweight sensors and SAM systems. This aspect would also favour application of own air power from medium to high altitudes other than in very specific instances demanding low level operations as, for example, of attack helicopter and dive attacks with dumb weapons by fighter bombers.

Air-to-air refuelling (AAR) would be an indispensable enabler in keeping attack and AD aircraft airborne for longer durations, enhancing their range and most importantly, optimising their weapons carriage potential towards EBO. In the future, UAVs, including the armed variety equipped for AAR could accrue significant force multiplication. The Heron, for example (which is already a weapons integrated platform), could be made available on almost continuous tasking and call through AAR. This, together with their inherent slow speeds and stealth, could make them highly adaptable and effective for applications in the high mountains.

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Active as well as passive electronic warfare (EW) would as always be indispensable. Aircraft would need to be equipped with automatic active and passive counter-measure systems, irrespective of their role and function.

LIKELY GENERALITIES OF THE AEROSPACE PLAN

Time and space constraints would place a premium on the conduct of parallel operations. Aerospace power would need planning for employment without hesitation right from the outset of hostilities. Its effects must be planned for accurate and customised employment in space and time. An integrated army-air force strategy would need to keep in mind the political realities alluded to earlier and air operations would need to be suitably tailored to meet the imperatives of speed and initiative.

ISR would be the most important opening element of the aerospace plan. Vertical dwell as against oblique sensing would be essential. Imaging satellites could provide effective high-resolution hyper spectral and synthetic aperture radar (SAR) surveillance of the expected battlespace and enemy forces. While manned aircraft could prove useful in certain conditions, UAVs, on account of their ability to operate for prolonged durations of time, in close proximity to the areas of operational and tactical interest could be indispensable as reconnaissance platforms. This would also be significant for targetting of PGMs. If done as a national endeavour by integrating the resources of all civil and paramilitary agencies, ISR could provide a clear picture of enemy centres of gravity. This could be matched against more specific human and machine degradation factors to provide a real perspective for value-based targetting in the mountains.

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In short duration, fast paced operations, air dominance in the required battlespace would be a prerequisite. Since AWACS operations could be restricted due to mountain shadows at low levels, offensive counter-air would need to hinge on the high level multi-layered AWACS supported action by air superiority fighters. AWACS would need to be employed and protected aggressively in accurate space and time regimes to achieve force multiplication. AAR would also need to contribute to supporting this endeavour.

For the purpose of targetting, identification of own COGs along with those of the enemy would need high precedence. Especially to ensure that own air power is able to function unimpeded in the face of enemy action. Therefore, among own

COGs, airfields (including helipads and FAARPs) in the rear areas would be one of the more important ones, not only for the air force but for the army as well. These would need to be protected through a resolute offensive and defensive counter-air campaign and a well-designed joint ground defence plan, while denying the enemy the same.

Against China, in support of our endeavour of the enemy ground forces movement denial plan, it would be crucial to identify centres of gravity perhaps biased more towards the operational and tactical level rather than the strategic level, as our prime objective in this regard ought to be focussed on deterring or thwarting rapid advance by its surface forces. In order to slow down and disrupt the pace of enemy operations, air interdiction would automatically assume high significance. Rear concentration areas, logistics nodes and choke points would perhaps be high on priority as early interdiction targetting and for repeat attacks.

The more or less fixed and predictable avenues of approach of enemy ground forces would mean that fixed interdiction targets could be pre-assigned for appropriate attack during the joint planning stage itself and actually negotiated according to time sensitive stipulations at the onset of hostilities. From the parallel operations viewpoint, this could be desirable as it would form a part of the air force's overall pre-planned counter-surface force campaign, running concurrently with all the other main air campaigns. Mobile targets in terms of enemy air mobile and manoeuvre forces, along with others in that class, could be left for tackling on emergent basis. Good situational awareness of the battlespace would perhaps mean that no air attack resources other than the barest minimum are kept tied down against immediate demand by surface forces.

Prioritisation of independent air interdiction as well as synergised battlefield air operations effort would need emphasis. In the mountains, given the expectation of relatively slow speed and unpredictable pattern of movement of the ground battle, the theoretical definitions of these terms could become somewhat obscured as battle lines are unlikely to be linear. Loose or ill-defined battle lines should demand the requirement for effecting close control of attack aircraft from the ground, not only in the contact zone but elsewhere as well. The traditional joint forward air controller mechanism might fail the demands of this

specific requirement. The situation would call for a more independent, flexible and mobile joint control team, capable of directing air strikes not only against battlespace targets, but across a wider spectrum on the lines of the SOF-TAC teams of Operation Enduring Freedom. As explained later, this would need to be a joint air force-army venture.

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Combat in the main battle area could turn out to be a series of isolated actions fought from strong points on ridge lines and in valleys. Battlespace air operations could be particularly effective in mountains, since enemy mobility, a crucial factor in the scenario, would be restricted by terrain. Other than fixed emplacements, vehicles and personnel would be particularly vulnerable to effective air attack when moving along narrow mountain roads. Precision-guided munitions could destroy bridges and tunnels. Under well-examined conditions, dumb weaponry in the form of free-fall bombs and large calibre rockets like the S-24 could be effective in causing landslides and avalanches to close routes or even collapse on both stationary and advancing enemy forces. Long-delay fused bombs could also be effectively employed to impede the enemy's ability to make critical route repairs to ensure mobility. Precision-guided munitions, as well as fuel air explosives could be used to destroy or neutralise well-protected point targets such as tunnel entrances, bunkers and enemy forces.

Armed and attack helicopters could be employed for missions in areas where AD systems are ascertained as absent. Nonetheless, they would need to invariably be equipped with active and passive self-protection suites. Performance limitations might mean that their effective utilisation could be confined to relatively lower mountain altitudes. They could also be employed to outflank retreating enemy, to set up positions overlooking likely withdrawal routes.

SOME SALIENT JOINT ASPECTS

Jointness would be crucial in the high mountains. The joint operational plan once evolved in advance would need to be bolstered by acceptance of responsibility

and accountability by each Service. In a short crisp confrontation in the mountains, in order to halt the enemy, firepower from the ground and air would need to be projected as a pre-planned, synergistic and efficient application of force in the required space and time.

To this end, offensive air power elements would need to be made quickly self-deployable to new locations within or adjacent to the required theatre and come into action effectively at the space and time of joint choosing. This should drive, in some scenarios, the preclusion of own surface forces to engage powerful enemy surface units in unnecessary close combat. Reducing or eliminating close combat requirements would complement the more lightly equipped mountain forces to redeploy quickly and retain capability of manoeuvre rather than get bogged down in a situation of potential attrition warfare that we could ill-afford in the mountains, particularly in view of our relative adverse ratio in terms of physical numbers of personnel and equipment.

The ground terminal attack controller (TAC), a modern day forward air controller (FAC), if you like, could become a key element in this process. The TAC, supported by land special forces, would be meant to precisely and efficiently maximise air power's effect on the enemy. Unlike the FAC-ACT team that is dependent on resources at the wing/division level, this new age team would need to be structured as a self-supporting unit with appropriate mobility and communications, that apart from aircraft control, should enable tasking and direction from the operational level. Mobility in the mountains may call for special measures such as provision of helicopter or animal transport. Whatever the case, TACs should help make air power decisive on the non-linear mountain battlefield. Of course, this new skill would need joint commitment in training and resources to produce a supportable number of TACs. The ability to provide live, realistic joint training in survival, communications and control of attack aircraft to maintain not only the TAC's proficiency but also to conduct initial TAC training and qualification would need to be an important joint organisational initiative.

There must be a clear understanding that space and time application of joint force can only be optimum when undertaken by each Service individually through

the pursuit of its specific core competencies at war-fighting. Hence, each Service cannot possibly ensure that every possibility in an operation is covered. We have little option other than to give latitude in terms of individual Service core competencies and build trust and synergy and lay the ground for synergised effects-based operations.

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CONCLUDING THOUGHTS

The successful implementation of effects-based joint operations in the mountains would require increased emphasis on the qualifications of commanders and staff at the operational level. The Services must treat qualifications for this level with the same thoroughness that is ascribed to tactical level qualifications. As is the case with tactical level units, all personnel, regardless of rank, would do well to demonstrate appropriate knowledge and judgment regarding operational level joint operations before being assigned command and control responsibilities.

Aerospace power would be crucial to the outcome of any future war in the mountains. The currently available and future developments in aerospace surveillance and battle management capabilities provided by indigenous satellites as well as our present and future combat aircraft and UAVs would need be threaded through broadband joint communications into an effective command and control, intelligence, surveillance, and reconnaissance (C2ISR) arrangement to make effects-based joint operations in the mountains a reality. Such battle management capability should make it feasible to exploit the accruing wide area situational 'awareness' to achieve the effect of 'paralysis' of enemy forces by targetting responsive, precise and lethal air attacks against enemy surface war effort that is in physical operation at an opportune space and time.

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