Seminar Report

CHANGING CONTOURS OF MOUNTAIN WARFARE: IMPROVING EFFECTIVENESS IN THE INDIAN SUBCONTINENT

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The Centre for Land Warfare Studies (CLAWS), New Delhi, is an independent think tank dealing with contemporary issues of national security and conceptual aspects of land warfare, including conventional and sub-conventional conflicts and terrorism. CLAWS conducts research that is futuristic in outlook and policy-oriented in approach.

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CONTENTS

EXECUTIVE SUMMARY

It is not only the Armed Forces that go to war, but it is between two nations which require the whole of nation's effort—polity, industry, and the people. In the Indian subcontinent, territorial disputes of India with China and Pakistan; the growing China-Pakistan ballistic missiles-military hardware development nexus; and, the almost unbridled march of radical extremism are sweeping across the strategic landscape. In the Indian realm, Pakistan and China are two continental perennial threats, which when escalated would surely flare up in the domain of mountains.

Conducting military operations in mountains or cold weather environment is complex and challenging as the fighting forces encounter two enemies—the environment and the opposing force. The Indian Army is the best practitioner of mountain warfare with maximum experience, as its officers and soldiers spend a major part of their service in the mountains.

The psyche of Indians would never accept the loss of any territory; everything, therefore, has to be defended. Resultant strategic implications would be—Army and the nation cannot trade space for offensive manoeuvres elsewhere.

The probability of a conventional threat in the Indian subcontinent would always remain till we have unresolved border disputes with our adversaries. There is a fairly high possibility that the future conflicts would trigger in the domain of mountains and may spill over the rest of the areas.

The complex mountainous terrain challenges force employment and deployment, creating difficulties in mobility and manoeuvre. Greater challenges are also anticipated in terms of stress on personnel and equipment, increasing non-combat losses, as well as magnified maintenance and repair requirements.

The underpinning for fighting future mountain wars would be—technology, firepower to include Air and Air Defence (AD), light and

self-contained Battle Groups, Special Forces (SF) and Scouts, robust infrastructure, tailor-made logistics, and mountain-oriented training. Innovativeness, physical fitness and specialisation, the three corners of the training triangle, are needed to be imbibed and achieved for fighting future wars in mountains.

The old concept of "holder's keepers" on LC, i.e. who captures the territory, it belongs to him thereafter, has got diluted after the Kargil Conflict. "Operation Vijay" changed the concept that the Line of Control (LC) has the sanctity of its own. If we are the holder of territory at the LC, and the other side captures it, we are bound to recapture it. Kargil War laid down this changed theology of LC which is reflected in the fact that post Kargil there has been no concept of exchange of posts captured.

Blindly templating the lessons of Kargil War, such as maintaining the numerical superiority of 9:1 for launching offensive has limited our strategic thinking and selection of objectives in the mountains. This needs to be avoided in the future.

With changing contours of fighting, conventional conflict in mountains could also be preceded and succeeded by a period of irregular conflict, which will include low-intensity conflict and prolonged stabilisation operation. Post-conflict stabilisation would be daunting in the mountains, vis-à-vis in plains and deserts.

Compulsions of ongoing proxy war are affecting our capability in fighting mountain warfare. The rapid transformation of PLA and infrastructure has resulted in a huge capability gap.

As we don't fight mountains we fight an adversary. There have been changes in our adversaries. In the case of Pakistan occupied Kashmir (POK), towards Gilgit-Baltistan side there have been changes in demography and Special Economic Zones (SEZs) are forthcoming in Gilgit and Bimbar. Power plants are also coming up in POK. In totality, areas under the China-Pakistan Economic Corridor (CPEC) project are witnessing changes. It can be concluded that, with so much at stake for China in Pakistan, the future scenario for India is assuredly a "Two Front War", with varying permutations and combinations.

There is a need to proactively plan for offensive options. We should plan warfighting and mobilisation in Ladakh during winters which get completely cut-off during this season. Potential and capabilities of the Scouts, conceptualised on "Son of the Soil" concept, need to be exploited and we should guard against their employment in plains.

As a defender, the importance of un-held areas needs to be understood. We have to be very careful with them. For acclimatisation, we need to always maintain some movement or presence at these un-held areas so that troops can move to higher areas if the situation arises. We have to give these troops light-weight arms and equipment and even disposable ammunitions.

We have to look at lighter formations as our formation headquarters have become logistic nightmares for movement. Converting the divisions into brigade groupings is already under consideration. In the super-high-altitude areas, employing division size forces is too unwieldy and therefore, self-sufficient brigade groups with their own logistics support are needed for speedy and sustainable offensive operations. Similar is required for Line of Actual Control (LAC), particularly in Arunachal Pradesh due to poor communication infrastructure in the State. A total review of weapons and equipment according to the terrain and changing battlefield requirements is also needed.

On LAC, we are on exterior lines. Due to Nepal and Bhutan, there is no way laterals can be put across. Therefore, our mobility and deployment of troops including offensive, have to be looked at in this light.

We have put together a Mountain Strike Corps but its structure requires a paradigm shift for ensuring effective and optimum response to eminent "Two Front Mountain War".

For Mountain Strike Corps, in terms of credible deterrence, we need to go beyond quid pro quo. We need to change our mind set from dissuasion to deterrence.

Our strategy and response needs to be a—Build a Doctrine, put in an effective Organisation, bring in Technology and Strategise the

response (DOTS Response). The bottom line is to build capability and reorganise to showcase a credible offensive intent.

Theory of modern warfare enunciated by PLA is "System Destruction Warfare"—not centred at the destruction of enemy forces on the battlefield or capturing of territory. The aim is to destroy the enemy's capability and their operating systems by kinetic and non-kinetic means, i.e. striking against key nodes. System confrontation is visible in many domains and Land is only one. Others are Air, Space, Cyber, Electromagnetic, and Psychological domain to achieve absolute domination. We too need to seriously think on similar lines.

During the Kargil War, it was realised that the Indian Air Force (IAF) had never practiced air to ground firing at those heights. Therefore, there is a need for high altitude air firing training ranges. However, what IAF immediately needs is 42 fighter squadrons.

IAF also requires more Unmanned Combat Aerial Vehicles (UCAVs). As a future concept, usage of swarms of Unmanned Air Vehicles (UAVs), for surveillance to disruption and for conducting functional kills, would be the order. Further, combining Artificial Intelligence (AI) into the swarms would enable them to accurately identify the person controlling the enemy swarm and thus, neutralise the enemy without completely destroying the aircraft.

In the mountains, precision attack by fighter aircrafts is important to ensure air superiority. Airborne Warning and Control System (AWACS) on the other hand, will be an important asset for radar coverage. Air refuellers will be force multipliers for a war across the Himalayas. In the future, India would surely require more transport aircraft for inter and intra-theatre movements and heavy and medium-lift helicopters for inter-valley movement.

Faster decision-making at the tactical level can only be achieved by jointness between the three forces. A total review of weapons and equipment according to the terrain and changing battlefield requirements is needed.

Armies are moving to network-centric warfare, with the implementation of network-enabled environments and network-

centric defence systems and so forth. This has enabled military commanders to function better in the decision-making spectrum.

Technology thus would be the driver of change in the twenty-first century and this is no less so in warfare. What is less certain and not easy to predict is, how technology will develop and how it would be adapted to improve military capability. The future trends of warfare are going to be determined by the comprehension of technology at the Strategic Level or the level of a Grand National Strategy.

In mountains, information has been and will continue to be a lever of power. Putting an effective Command, Control, Communications, Computers, Intelligence, Information, Surveillance, and Reconnaissance (C4I2SR) system has never been as critical, given its impact on speeding up the Observation, Orientation, Decision, and Action (OODA) loop and potential to enhance shared situational awareness and speedy decision-making. Way ahead in C4I2SR for mountain warfare can be summarised as follows:

Near Term

- Stage-up telecom Point of Presence (PoPs) and surveillance bases as far forward as practicable.
- Prioritise the execution of Network for Spectrum (NFS)/ Automatic Switched Communications Network (ASCON) Phase IV and Mission Controls and Communications System (MCCS); and the fielding of Mountain-Border Surveillance System (BSS) and Battlefield Operations Support System (BOSS).
- Train and equip regimental Signallers for effecting resilient surveillance communication from sensor to Battalion HQ.
- Propagate the use of hardened servers at Battalion Surveillance Centres, with focus on data archiving and retrieval, data compression and error correction technologies, for efficient exploitation of available bandwidth.
- Institute procedural measures to ensure that different components of the surveillance network being executed through disparate projects/grants become co-terminus.

- Address concerns related to sensor-power-management and other technology-challenges through the Army Design Bureau (ADB).
- Stream-line the interface of formation Image Interpretation Teams (IITs) with Defence Image Processing and Analysing Centre (DIPAC) to facilitate the flow of imagery data.
- Be prepared to purchase corroborating satellite imagery and hire transponder bandwidth like foreign satellites, as a measure of redundancy.
- Conduct competitions amongst civilians and organise Indian Army's annual innovation melas on specific surveillance-related themes to tap into latent talent.

Middle Term

- Undertake comprehensive re-structuring to ensure single parentage for surveillance aspects, at formation level, with matching review of Human Resource (HR) aspects.
- Incorporate measures for credible Human Intelligence (HUMINT) Task-specific agencies to build a Social Media Intelligence (SOCINT) and Open Source Intelligence (OSINT) database within acceptable timelines.
- Carve out a separate budgetary head for surveillance, as done for Security Related Equipment (SRE), through which all procurement aspects can be harmonised.
- Provide deployable capability for direct download of satellite imagery to all Corps HQ, in a phased manner.
- Ensure better coordination of regional Commands with units under the Director General of Military Operations (DGMO) and the Director General of Military Intelligence (DGMI).
- Put in place mechanisms for better Intelligence, Surveillance, and Reconnaissance (ISR) synergy in the Tactical Battlefield Area with the IAF, DIPAC, Signal Intelligence (SI) and other non-organic resources within the three Services; which must be rehearsed.
- Strive to achieve gap-free AD radar coverage.

Long Term

- Undertake capability and capacity-building in terms of heliborne, air-borne, UAV, aerostat, and space-based platforms through the Indian Space Research Organisation (ISRO), the Defence Research and Development Organisation (DRDO), Army Reconnaissance Course (ARC), and the defense industrial base.
- Ensure inter-agency synergy and information-sharing with organisations beyond the three Services.
- Take up AI-based ISR and OSINT projects with tangible bite sized goals, through an empowered steering group.
- Lobby for border area telecom infrastructure development to be accorded national priority, to afford greater redundancy to military telecom infrastructure.

Rashtriya Rifles (RR), a potent and battle inoculated force, can be employed in conventional operations; however, they require operational training as well as restructuring for a conventional role.

Isolation of the battlefield and shaping of the targets have to be Intelligence Preparation of Battlefield (IPB) driven. Limitations in the movement of rotary wing aircrafts and night surveillance capability are still a persisting problem in mountains.

Firepower is a key component of combat power. Need to relook at the concept of fire support on the LC.

In fire support domain, the time-consuming counter actions, movement of guns to the border causing lower densities, and near absence of precision inventory further compounds our war-waging capability and effectiveness in mountains.

The capability of weaponised rotary wing effort, Attack Helicopters (AHs) and medium range battle support lift should be integral to the Army. Strategic lift and Air Support capability need to be with IAF.

Availability of Satellite Surveillance with enhanced availability with compressed timelines would be invaluable for effective fire support.

Artillery communication philosophy for mountains needs to be revisited.

Mountain firing ranges for realistic arty shoots and new ranges, not compromising manoeuvres and trajectory management need to be looked into. Ranges for Air Force in Mountains—Joint Practice with Army also needs to be planned and catered.

Aspect of AD in mountains is extremely important and primary for survivability.

The employment of SFs at present is very tactical. They need to be employed more imaginatively and strategically. They need to train in the utilisation of firepower assets including air; be part of Nano-technology utilisation—lightweight equipment and weaponry; enhancement of their staying power, communications, and survival aspects needs a de-novo look.

Even for heliborne operations, our operations should be relooked seriously, loss of one helicopter in an operation should not jeopardise the entire operation.

There is a need to have a concerted focus on the infrastructural differences between China and India. One such example of disparity is Tibet, where China has constructed 24,000 km of road in the last 5 years from 2012 to 2017.

Integral connectivity is a major issue in Arunachal Pradesh and thus poses a major disadvantage in the operational window as of now. The current status of the Northern border has an issue of availability of proper funds, though in Leh-Ladakh region a number of alternate routes have come up in the last 5 years. On the Western front, India has new alignments and is coming along with projects.

In a mountain battle, the two most vulnerable things of administrative nature are Ammunition and Fuel, Oil, and Lubricants (FOL). Tunnelling on the reverse slope of the hills seems the apt answer by which we can have a safe logistical installation in the forward areas.

Need to institutionalise maintenance of Armoured Vehicles, deployed in mountains. Instead of moth-balling, cocooning should be used to protect engines of the vehicles.

A tailor-made logistics, which fits the requirements of each sector, must be worked upon. Economic development following the Chinese model of "a strategic thought with an economic dividend", like implemented in the Tibet Autonomous Region (TAR), which is advertised for tourism instead of propagating strategic relevance, should be considered a model worth replication at home.

DETAILED REPORT[1]

CLAWS conducted a National Seminar on the "Changing Contours of Mountain Warfare: Improving Effectiveness in The Indian Subcontinent" on December 12, 2018. Important issues highlighted at the Seminar are given in succeeding paragraphs.

Objective of the Seminar

The objective of the Seminar was to carry out a broad-based analysis of prevalent warfighting capabilities of the Indian Armed Forces in mountains and bring forth coherent suggestions to improve their effectiveness in mountains with the changing battlefield milieu.

Conduct

The Seminar was conducted in three sessions as under:

- **Session I. Changing Attributes of Warfare: Future Contours and Trends**
  - Prospective Security Environment and Changing Character of Warfare
  - Air Power in Mountains: Future Challenges and Responses
  - C4I2SR Capability: Need for a Realistic Approach
- **Session II. Reshaping Operational Art in Mountain Warfare: Challenges for the Indian Army**
  - Mountain Warfare in Indian Subcontinent: A Paradigm Shift?
  - Construing Future Challenges for Indian Army in Mountains and Measures to Mitigate Them and Concept of Mountain Strike Corps
  - Optimisation of RR in Conventional Mountain Operations

[1] The aspects enumerated as part of this Report are exclusively based on the deliberations by panellists. These do not necessarily conform to the views of the Centre for Land Warfare Studies (CLAWS) or that of the Indian Army or the Ministry of Defence, Government of India.

- **Session III. Decoding Future Mountain Tactical Operations in the Indian Context**
  - Synergised Firepower and Air Land Considerations in Mountains and Prospective Concepts in SF Operations
  - Operational Logistics: Impending Considerations and Way Ahead
  - Confronting Infrastructural Problems

INAUGURAL SESSION

Welcome Address

During the inaugural session, the following issues meriting considerations were raised—what should be the nature of mountain war in the future? What should be the character of war in the future? And what are the strategies to adopt to look at the war in the future?

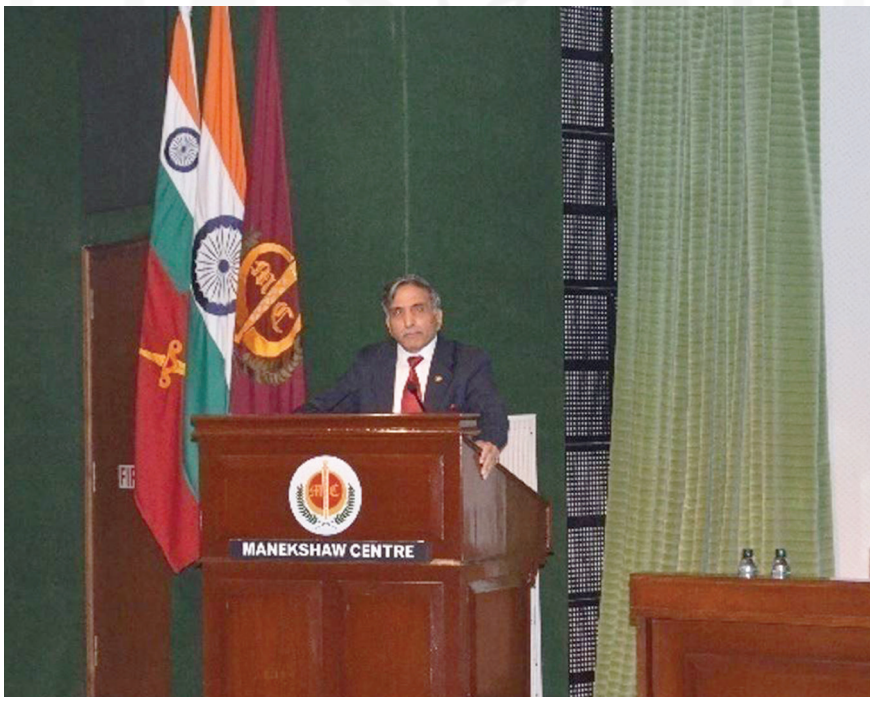

Plate 1: Lieutenant General (Dr.) VK Ahluwalia (Retd), Director CLAWS

Lieutenant General (Dr.) VK Ahluwalia (Retd), Director CLAWS, in his opening remarks brought out that the "Kargil Conflict", which is the only modern war in the world that was fought exclusively in mountains, brought forth a large number of lessons; questioning the very basics of the Indian mountain warfare capability. He elaborated that the whole nation, in 1999, was in a hurry to see some results. Formulation of operational plans and to execute them was very exigent and the 8th Mountain Division accomplished those plans with a great amount of success.

The Indian Armed Forces, supported by the nation, were able to transform an adverse situation into a political, military, and diplomatic victory. Giving a brief account of the importance of battles fought in mountains during 1947, 1962, 1965, and 1971, he pointed out that, due to our unresolved border disputes with our adversaries, a possibility of conventional conflicts in the Indian subcontinent still exists. However, it is likely that such conflicts would trigger in the mountains and then spill over to the rest of the areas. Elaborating on future of conflicts, he opined that after the two World Wars, it was acclaimed that the wars would then be over. But after 100 years, we already have seen so many conflicts and will continue to see them, especially like those seen along the LC and the LAC. The characters of conflict would change with changes in technology and geopolitical situations and we need to keep abreast and plan accordingly. Though the battle in the mountain will remain Army predominant operations, no future war plan would succeed without achieving massive asymmetries in the application of synergised firepower in which Air Power would be predominant.

He explicitly spelt out that, during the Seminar, an analysis is needed of the future characteristics and dynamics of war in mountains. The discussion on the nature of war will be taken after considering characteristics and strategies that we need to adopt for fighting in mountains. The focus of the Seminar is to address the multifaceted challenges with regards to Mountain Specific Military Strategy, Upgradation of Firepower Capabilities, Heliborne Capability, Air Operations, Efficacy of Joint Integrated Theatres, Refinement in C4I2SR Capabilities, Logistics and Infrastructure.

Inaugural Address

Everyone wants to climb and live on top of a mountain.
But your climb and happiness on the top depends
on your preparations.

General VP Malik, Former COAS gave out the "mountain warfare primer" based on his experiences of Kargil Conflict.

At the outset, he brought out that geo-politics and technology have made the Himalayas lose their relevance and they are no longer capable of guarding India. Technology, because every piece of Himalayan terrain, can now be seen and monitored. Pipelines and railway lines have been constructed. With high technology and capability to see and measure every inch, security of Himalayan territories, including Siachen, has become as important as any other area. Routes of ingress are everywhere. Adversary as well as we can make use of major routes for large-scale movement. Elsewhere, it is possible to infiltrate on foot/by helicopters and occupy heights, which would be difficult and costly to be retaken.

He brought out that the psyche of Indians is that they would never accept the loss of any territory. Every territory, therefore, has to be defended but, the resultant strategic implications are—Army cannot trade space for offensive manoeuvres elsewhere; a handicap which magnifies in a limited war scenario. Greater attention has to be paid to surveillance and close defence of LC and LAC. Currently, patrolling for surveillance is not good enough for which we need to make full use of C4I2SR technologies, including small surveillance and logistic drones at the unit/formation level. Drones, equipped with cameras are needed for surveillance and must also be used for logistic purposes. The Indian Army was handicapped in surveillance during the Kargil War. Even surveillance by helicopters was not successful in identifying the infiltration that had taken place.

Elaborating the aspect of slow mobilisation, he pointed out that, before the Kargil War, the decision was taken to re-induct one brigade into Ladakh Sector. But unfortunately, the process was so slow and incomplete that two of its battalions were unable to reach in planned time frame. This brought in an operational imbalance in

Ladakh Sector. So, 14 Corps was raised and this was a good decision taken as seeing the circumstances, 15 Corps couldn't have been able to control the area.

He brought out that, there was a difference of opinion between the Army and the Air Force before the Kargil War. The Army was of the opinion that helicopters should be inducted straightaway, but it took a little time. He also opined that the three Chiefs must get together and work on any kind of such conflict. Faster decision making at tactical level can only be achieved by jointness between the three Services. A total review of weapons and equipment according to the terrain and changing battlefield requirements is also needed. The Army must look for lighter weapons and equipment with upgradation of its firepower capability, especially of the larger number of Medium guns like Bofors.

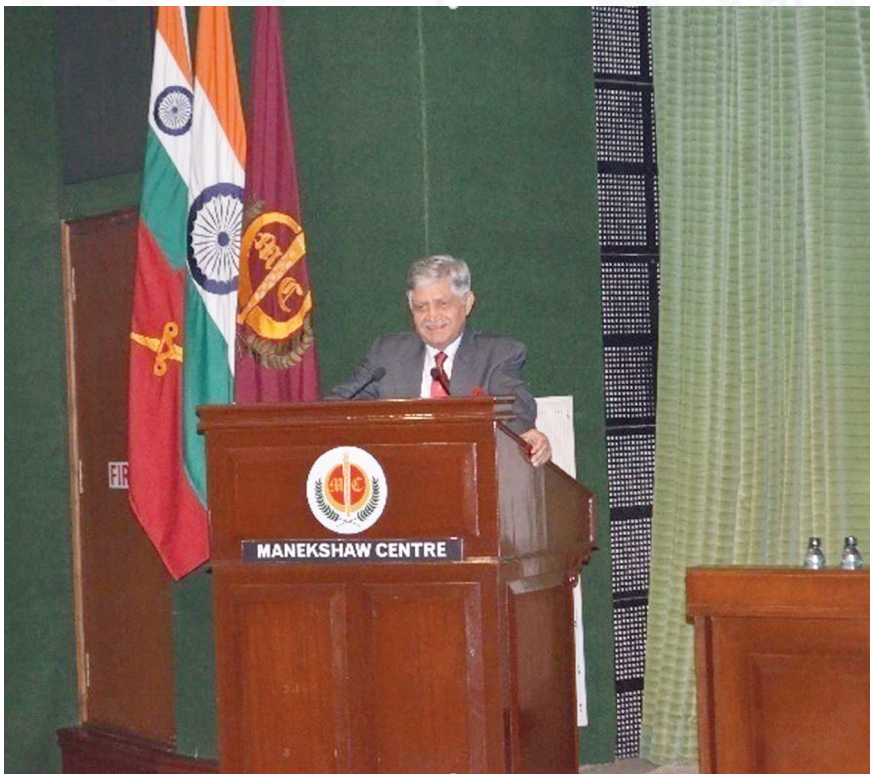

Plate 2: General VP Malik (Retd), Former COAS

Highlighting the importance of Logistics and Infrastructure he added that, both were lacking during the Kargil War. There were no roads during the War. Additional engineer regiments were posted in order to construct the roads in the Batalik sector. There is a need to be aggressive in this aspect by constructing better roads for movement. Giving out the significance of casualty evacuation in mountains by air, he brought out that, 1,361 casualties were evacuated out of which only 14 died which was a very commendable job that the Cheetah helicopters and doctors did. Hence, the Army needs its own fleet of light and medium helicopters for mountainous terrains.

There is a requirement of more number of Specialised Forces like Ladakh Scouts, 9 and 10 Para SF and the HAWS instructors, who were never enough during the Kargil War. We, in fact, need more specialised units with specialised equipment for them. During Operation Vijay, Combat superiority for attack even up to the ratio of 5:1 was found to be inadequate. In the majority of cases, attacks succeeded when the ratio went as high as 9:1. Classic set-piece unidirectional attacks; even attacks from two directions are less likely to succeed. Multi-directional attacks with lesser strength were found to be the only successful method of unbalancing the enemy and maintaining the momentum of the attack.

Importance of physical fitness cannot be overlooked as the Indian Army has compromised in this area. Physically fit officers, Junior Commissioned Officers (JCOs) and Non Commissioned Officers (NCOs) are needed. We need to be very careful as mountains require fit and innovative minds thus, we need to lay emphasis on these aspects during our training.

Theme Address

Lieutenant General Mohinder Puri (Retd), Former DCOAS (IS&T) and GOC 8 Mtn Div during the Kargil Conflict brought out his experience of commanding the Division during the conflict. He began by pointing out that the biggest challenge faced was to change the mindset of troops, who had moved from CI operations, and the aspect of acclimatisation.

Operationally, the biggest problem in Kargil was of intelligence. Accurate Intelligence was not properly collected as patrolling was not up to the mark initially. At the grassroot level, defensive formations were totally ignorant of the whereabouts of the enemy especially, its position and strength. The innovative deployment of Bofors, in direct firing role, completely changed the face of war. Bofors literally became part of the Infantry Battalion weapon.

The Air Force was having a problem in high altitude. Their engagement of targets for supporting the ground forces was not very effective. The Air Force didn't have the capability to operate during nights while the ground forces were working only during the nights. Nevertheless, IAF was a great morale and psychological booster.

Para Commando Units were not fully exploited because of the terms of reference given of, not crossing the LC. They were unfortunately employed in an infantry role which should have been curbed.

Plate 3: Lieutenant General Mohinder Puri (Retd), Former DCOAS (IS&T)

By and large, the attacks were generally uni-directional and not multi-directional because of the terrain. The importance of physical fitness was brought forth during the entire conflict. There seems to be no need to tinker with the infantry organisation, instead we should enhance the authorisation of officers in infantry battalions and reduce the number of JCOs as we need young and physically fit officers. Young officers have the courage and dynamics to cope up with such situations.

Keynote Address

The COAS spoke on key issues affecting the Army's perception and preparations for a future war in mountains. He highlighted the primacy of land forces in the current as well as future wars. He stressed that it is not only the Armed Forces that go to war, but war is also between two nations and it requires the whole of nation's effort—

Plate 4: General Bipin Rawat, COAS & Patron CLAWS

polity, industry, and the people. He accentuated that future wars in the Indian context would surely be fought in the mountains, for which first and foremost need is of surveillance. Proper knowledge of the ground can only be acquired by going and serving on the ground and not merely checking by sitting in helicopters. It can only be achieved by people in boots supported by proper infrastructure. We need to look into infrastructure and building of roads which presently is of paramount importance. Further elaborating on surveillance he added that we need to exploit technology to our advantage. We have come out with a statement for manufacturers that we want a drone that can carry 20 kg of payload at altitudes of 15,000-16,000 ft. Even the Chinese failed to do such a task during the Doklam crisis although sightings of drones and helicopters at the China border have become common today.

Dwelling on physical fitness he said, the lowering of the age of Commanding Officers (COs) is not a good idea. A 40-year-old CO will also be able to do his task by being fit. In fact, a brigade commander too needs to be fit. If he is unable to climb then he must make way for someone who can do this. We have to remove those who are not fit.

Emphasizing on specialisation he said, "This is an aspect which is the need of the hour." The significance of SFs in mountain warfare needs no elaboration as they are imperative for success. They are the force multipliers who can conduct operations in small teams and can infiltrate in small numbers. Concomitantly, Scouts have also become inevitable as they are from the same region, are used to the climatic conditions, and know the local language. Being "Sons of that Soil" they can get better information and will innovate things to get you success. However, such local people, in spite of being the one who can deliver, may not have the education to get enrolled. So, the moot question is, how can we enrol them? For such regions, we have to change the recruitment rules and tweak our policies to gain an advantage. Besides, we are diluting the concept of "Scouts" with some of the Scout battalion's coming to peace stations or by having their attachments to peace formations. Citing an example he said, in the past, some Scout units have moved to Secunderabad and Kanpur.

Such places are not meant for them to be at. Also, Scouts today are placed in a defensive role like the Kumaon and Garhwal Scouts, which needs to be curbed. Elaborating, he added that unfortunately in some Scout Regiments a few percentage of boys do not belong to the border areas. He further elucidated the point by giving the example of 2 Sikkim Scout wherein, Lepchas and Bhutias are less than 15 percent, with major troops being recruited from plains.

The Chief of the Army Staff categorically brought out the importance of un-held areas in mountains. He brought out that we have to be very careful about them. For acclimatisation, we need to always maintain some movement or presence at these un-held areas so that troops can move to higher areas if the situation arises. We have to give them light-weight arms and equipment and even disposable ammunitions. We have to look at lighter formations as our formation headquarters have become logistic nightmares for movement. The formation headquarter has to be lightweight too. We must look at the restructuring of the Mountain Strike Corps.

Cautioning of not being tied down by the trends of Kargil Conflict, the Chief said that Kargil was not the best way to fight in the mountains and should not be templated for future wars in mountains. Additionally, the COAS also spoke about Non-contact Warfare. He said it is gaining ground and may find better application between nations before militaries are launched in the battle, as seen during Doklam standoff, wherein China resorted to cyber, information, legal and coercive warfare, just short of the actual confrontation between the two forces. He brought out that while planning for mountain warfare, it is pertinent to be prepared for Non-contact Warfare. Yet, it doesn't mean that we will be able to fight without boots on the ground because wars are won by capturing of territories, which can only be achieved through contact warfare.

Talking of importance of training for fighting in mountains, he brought out the pertinent issue of high altitude ranges in the North and North-East to check the behaviour of the weapon systems and ammunitions at higher ranges. For modern-day fighting in mountains, he laid out the importance of exploiting the guided weapon systems which are the most potent for such terrains.

Deliberating on the irrefutable importance of innovation, he gave the example of Major Gogoi by bringing out the fact that, whatever he did was not taught to him anywhere. Nevertheless, he also brought out that the next time, this may fail and in a battle scenario, it's only the innovation by the man on the ground that will give success.

Finally, the COAS emphasised that we must be prepared for conflict on both fronts. Nuclear weapons are weapons of deterrence but, to say that nuclear weapon States do not go to war, is also not true and war lies in the realm of reality. There appears to be no likelihood of reconciliation with our Western neighbour as their polity, military, and people have been made to believe that India is their long-term enemy, all out to bring their nation to pieces. The proxy war by them is testing the tolerance limit of our nation, thus increasing the scope for conflict. For the Northern neighbour, flexing of muscles has started; taking over territory in a very gradual manner and testing our limits of the threshold is something we have to be wary about and remain prepared for the emerging situation.

SESSION I: CHANGING ATTRIBUTES OF WARFARE: FUTURE CONTOURS AND TRENDS

In the opening remarks, the Chair highlighted the overriding influence of information and technology, and Non-contact Warfare overtaking contact warfare. With an increasing number of stakeholders, the potential for competitions, conflict, and hostilities are also rising. There is a paradigm shift in the nature of the conflict. International order does not apply to non-State actors. Resource constraints, energy needs, ideological differences, and extremism are contributing to a spectrum of conflicts, including internal armed conflicts adding it a new dimension.

Prospective Security Environment and Changing Character of Warfare

Armies do not prepare for the last war, they frequently prepare for the wrong one if for no other means and reason, then that government

will usually fund only the anticipated primary threat, as opposed to risk and the adversary will usually play to his opponent's weakness, that is the risk rather than to his strength the primary threat.

– General Rupert Smith

A few decades ago, it was relatively easy to predict how the nature of warfare would unfold as it was intimately linked to the statecraft. So, one could identify its adversary and prepare accordingly. One could even quantify strength and having identified it, could develop its capability. However, threats are no longer easy to quantify and sometimes even difficult to identify. There has been a fusion of various types of warfare. International rules were applied to non-State adversaries and deterrence, coercion, and escalatory dynamics have been turned on their heads in numerous places. Against such uncertainties, it is no longer easy to define the capabilities that a nation requires to meet its aspirations and safeguard its vital national interests.

The character of warfare today is more determined by political, social, economic, and strategic imbalances than it is by the military aspects. The disintegration of the Soviet Union in 1991 and the attacks on the US in September 2011, transformed the definition of security. Today, therefore we live in the uncertain security scenario of "No War No Peace".

There has been a paradigm shift in the very nature of conflict. Territorial issues are important but other issues related to historical differences, ideological biases, economic disparity, energy needs, water shortages, etc. are concluding factors for the conflict. Modern day conflicts are not merely confined to States but have expanded to include sub-nationalities, religious, and ethnics interests. The nature of the conflict today encompasses sabotage, subversion, and non-kinetic confrontation as traditional armed conflict in all its form. Thus, the State's response has to be balanced, inclusive, and one that incorporates political, economic, societal, and military resources.

While there has been a sharp decline in direct armed conflict between nations, the internal armed conflict has increased. In fact, since the end of World War, there have been about 25-30 direct

nation-to-nation conflicts, the conventional conflicts. But, on the contrary, there have been over 125-150 sub-conventional conflicts. It's a different reason and a diverse phenomenon that most of these sub conventional conflicts have not reached a decisive conclusion except in very few cases. Under such conditions, what does a nation prepare for, specially a nation like India? To the conventional threat on both the fronts, an emerging maritime challenge and a sub-conventional threat, supported from across the border.

War is distinct from a conflict. The conflict is a vast canvas including all shades of discord important for State and non-State, both. There are various instruments of dealing with conflicts while war is basically the employment of forces in achieving the political aims.

Technology is the driver of change in the twenty-first century and this is no less in warfare. What is less certain and not easy to predict is, how technology will develop and how would it be adapted to improve military capability. However, it will be safe to say that the future is unlikely to be a linear extension of present trends. Wars of the future are likely to see an asymmetrical competition between high-technology and low-technology weapons. In the Indian context, we need to introspect as to what has really changed at the battalion and brigade level since the Kargil War. Therefore, the attempt of the Army at present should be to get at least the affordable technology into the cutting edge—let's get affordable technology which works at the cutting edge.

The future characteristics of conflicts, thus, can be summarised as—the spectrum of conflict will raise from conflicts between States to conflict proxies and India is facing both; the boundaries between regular and irregular warfare are blurring, even non-State actors are increasingly acquiring limited conventional capabilities; and conventional conflict could also be preceded and succeeded by a period of irregular conflict, which will include low-intensity conflict and prolonged stabilisation operation. The pre-stage is already been experienced in J&K today. For operations in the mountains, we need to be very clear as to how post-conflict stabilisation would take place,

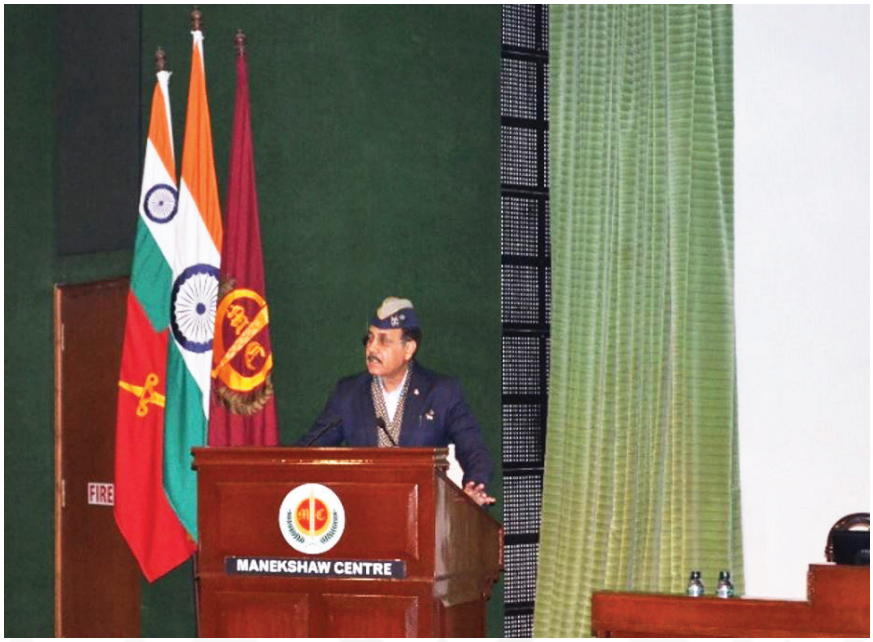

Plate 5: Lieutenant General AK Singh (Retd), Distinguished Fellow, CLAWS

as the post-conflict stabilisation is indeed challenging in the plains and desert, but it is actually daunting in the mountains.

Technology has empowered individuals today. Even a single terrorist can cause extensive damage to an adversary through cyber, financial, and kinetic attack which earlier only the organisations of larger States could do. Suicide bombers today have added a destructive dimension to future conflicts. Future conflicts will, therefore, demand concurrent investment in sharpening softer skills like cultural awareness, training and language skills, psychological operations, and HUMINT. Non-contact and non-kinetic aspects of warfare are coming to the fore, especially between well-armed and nuclear-capable adversaries like China and India. Cyber and Space are the merging frontiers and nuclear sabre rattling by irresponsible States like North Korea and Pakistan is beginning to upset the nuclear deterrence.

Hybrid warfare is a military strategy that blends conventional warfare, irregular warfare, and cyber warfare. This approach to

conflict is a ported context variation of warfare. Hybrid warfare can be used to describe the flexible and complex character of the battlespace which requires a highly adaptable and resilient response.

In the emerging security environment of India, we have two hostile neighbours and with both, we have boundary issues. One of these two neighbours also happens to be a growing super power whose vision is of a bi-polar world and a uni-polar Asia which makes the security context more challenging for India. China is not an irrational power; it is unlikely to spoil the ascendance role by resorting to an all-out war with India. While considering then and now, how China would use its force, it may be wise to heed the advice of R. Alison, a noted Theorist and Practitioner in the field of national security, who said "It is not sufficient to ask what we would do in its shoes, for Chinese leaders, military force is an instrument in an orchestra of engagement, one they may use pre-emptively to surprise an opponent who would have not done likewise."

It also bears consideration that while China will treat warfare as a last resort, should it conclude that the long-term trends are no longer moving in its favour and that it is losing bargaining space, it could initiate a limited military conflict to cut India to size.

Under the aspect of force capability dilemma, to meet merging threats and challenges, it may be pertinent to reflect the insight provided by David Kilcullen, a great practitioner of warfare, on as to why the recent land wars in Iraq and Afghanistan went awry. He opined that the wars were inadequately managed and resourced. Strategy without resources, therefore, in his opinion is a mere fantasy.

We may, therefore, need to seriously consider whether our defense allocations, at approximately 1.60 percent of the GDP, are adequate to address the great challenges/monumental adversities in our security environment. It is also for our collective consideration, that why defense must certainly not unduly burden the country and economy. It can be nobody's case that capability-building in national security by the premise only on economic considerations and in uttered disregard of geo-political/geo-strategic realities.

The matrix of affordability in defense budgeting must be addressed by our geo-strategic needs and pure economic scalpel that is obliged to defense budgetary allocation year-after-year. It is a matter of intellectual and strategic concern.

We need a favourable politico-strategic-military construct, as military construct alone is not going to suffice, to facilitate pursuance of our national security.

Air Power in Mountains: Future Challenges and Responses

The primacy of air power has been established over the last few decades. In fact, the Armies and Navies of the world are wanting to acquire more aerial platform, than they want to acquire their tanks, ships, and submarines. For the success of the surface war, whether it's on the land or sea, it has become more or less imperative to win the air war or at least dominate the air.

In the Indian context, any future war is going to be mostly in the mountains and the IAF is fully aligned to this fact. During the Kargil War, there were serious restrictions on IAF not to cross the LC and this deterred the type and direction of attacks. Air Power cannot produce full effects with such restrictions. During the Kargil War, it was realised that IAF had never practiced air-to-ground firing at those heights. Air Force, in fact, lost two aircraft because when the rockets were fired, the airflow was disturbed and the engine flamed out. One can't fire rockets even today at some of those heights. We, therefore, need to use PGMs or missiles. The existing AHs could not be used at those heights. The type of targets in Kargil War were either bunkers or logistic bases. Using airpower in the area of 20 × 20 km poses many restrictions. Yet, it was found that Laser Guided Bombs (LGBs) can take out individual bunkers. In fact, the LGB attacks became the game-changers and greatly helped accelerate the war to an end and also saved many Indian casualties due to reduced Pakistani resistance. Our Quantum of LGB has also increased and most of our aircrafts now are capable of dropping LGBs. Mountain flying, in general, is very peculiar and there are issues related to clouding, winds, dead valleys, etc., which need to be factored-in and trained for.

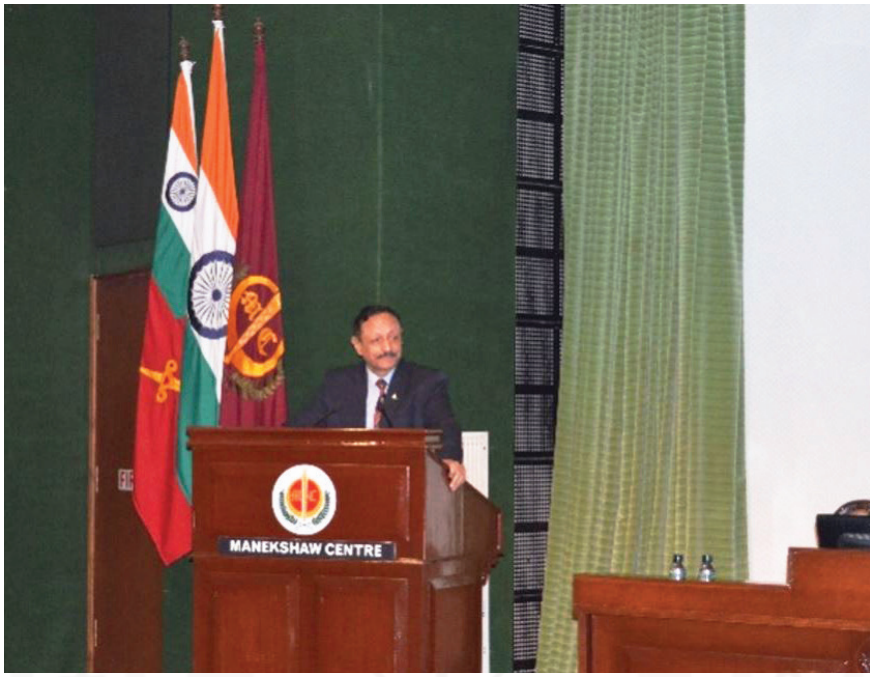

Plate 6: Air Marshal Anil Chopra (Retd), Distinguished Fellow, CAPS

Jointness is the future; if we really need to achieve this then the right time is to do it in the beginning. IAF has got officers in each Corps and Command headquarter of the Army and Navy equivalent. Besides, a lot of good work is going on in J&K and Siachen. The helipads and Advance Landing Grounds (ALG's) have been updated; the communication work and valley fighter training is also going on. A critical issue for attention is the need for high altitude air-to-ground firing ranges for the fighters to practice weaponry. As a nation, we have not been able to solve this problem for 30 years.

Analyzing the Chinese air strategy, China like USA believes that he who controls aerospace controls the planet. China plans to build for asymmetric advantage and move the battle into the enemy's territory. Their Air Force is a showcase of unprecedented modernisation. They aim to strike first and in India, Arunachal will be their focus area. They would also try to knock out our Eastern air bases, using surface-to-surface missiles, which they think are difficult to defend against.

The Indian Air Force has a large number of airfields in the East. China has got only seven or eight in the Tibet which are at high altitude with their inherent limitations. We have a clear edge as far as number of airfields is concerned. Similarly, on the Northern front, we have a clear advantage in airfield numbers, vis-à-vis, Pakistan.

What do we need in the future? First, we need 42 fighter squadron at the earliest; we need more high altitude air firing training ranges and IAF requires more UCAVs. As a future concept, usage of swarms of UAVs, for surveillance to disruption to conducting functional kills, would be the order. This concept would be more potent if the swarms are capable of travelling at hypersonic speeds, giving them better opportunities to combat and kill enemy aircraft. Further, combining AI into the swarms would enable them to accurately identify the person controlling the enemy swarm and thus neutralise the enemy without completely destroying the aircraft.

In the mountains, Next-generation aircraft would be multirole, stealth, with super cruise and super-manoeuvrability features. Precision attacks by fighter aircrafts are important to ensure air superiority. AWACS, on the other hand, will be an important asset for radar coverage. Air refuellers will be force multipliers for a war across the Himalayas. In the future, India would surely require more transport aircraft for inter- and intra-theatre movements and heavy and medium-lift helicopters for inter-valley movement.

Computers, Intelligence, Information, Surveillance, and Reconnaissance

Measures to Strengthen the Computers, Intelligence, Information, Surveillance, and Reconnaissance Architecture in Mountains

Information has been and will continue to be a lever of power. Putting an effective C4I2SR system has never been as critical, given its impact on speeding-up the OODA loop and potential to enhance shared situational awareness and speedy decision-making. A huge percentage of India's border comprises mountainous terrain which is characterised by high altitude, rugged terrain, and harsh weather conditions. Operational realities on the LC/LAC impose

additional peculiarities, such as limited forward deployment, leaving large unmanned stretches, and un-held areas (more so along the LAC). Presently, we have poor infrastructure (in terms of surface communication and telecom) with no viable national imperative to develop these areas as per requirement. It may also be impractical for the Army to meet the requirements by itself owing to the budgetary constraints and competing priorities.

There is a need to de-construct C4I2SR into three components—Surveillance, Communication and Information System, and Social and Cognitive Domain.

Surveillance

Desired attributes would be a persistent 24 × 7 availability with a multi-layered—HUMINT, Social Intelligence (SOCINT), OSINT, and Tech Intelligence as its main constructs. It should be multi-tiered (gap-free), multi-sensory (to offset sensor-technology gaps), multi domain (sensors based on ground-air-space platforms) and of the kind that is capable of operating in mountainous weather conditions. It would be desirable that it conforms to a federated architecture as against a hierarchical one to enable speed of information dissemination. Furthermore, it should enjoy long-range reach into the strategic depth of the adversary, as well as be capable of working through counter-ISR measures. Ideally, plug and play access into a robust "Info Grid" should exist.

Of the ongoing surveillance projects, the Battlefield Surveillance Systems (Project Sanjay) has been fielded in three divisional sects. Its mountain version is expected to be fielded by mid-2019 in one of the Corps Zones in a limited manner. The DRDO (Instruments Research & Development Establishment [IRDE]) is developing deployable sensors under the Border Surveillance System (BOSS) programme; however, a lot still needs to be done.

In the face of existing deficiencies, certain interim solutions have been adopted by field formations to address their concerns. But, this interim architecture is ad hoc, simplistic, platform centric, hierarchical, and inadequate. In fact, a systemic issue is

that surveillance, unfortunately, does not have a single parentage. To illustrate this point, we may reflect and note that there is no single organisation that is accountable for surveillance end-to-end, in the Indian Army today. Additionally, inter-operability concerns like non-standardised interface, legacy technology, etc., all plague the physical implementation of surveillance. More often than not, ground-based sensors which are of diverse Commercial off the Shelf (COTS) and War Equipment Table (WET) origin are all constrained to Line of Sight availability, hence prove inadequate in mountainous terrain. Finally, the state of holding of these kinds of sensors is often inadequate; while performance under adverse weather conditions is less than desired.

The power supply is a critical component for surveillance to be effective, both at the sensor end, i.e. at the posts and the surveillance centre ends where data aggregation takes place. Inadequacies in this regard act as a perpetual hindrance. As far as UAVs are concerned, today we hold only imported birds. Our holding of Ground Control Stations (GCS)/Advance Mobile Receiving Station (AMRS) is limited, which acts as an operational constraint and restricts flexibility on occasions. While range extension in Airborne Data Relay (ADR) mode is possible, there is an urgent need to be able to leverage satellite cover to fully exploit UAVs in the mountains. As far as UAV payloads are concerned, we have access only to Electronic Intelligence (ELINT) sensors but none with Electronic Warfare (EW) capability in this context, exploitation of non-organic aerial platforms (those of the IAF) can afford an opportunity. Availability and exploitation of space-based sensors should be another major focus area.

Imaging in terms of dual-use remote sensing platforms needs to be certainly looked at; however, satellite revisit periodicity is a challenge. Access to this imagery is restricted by red-tape or media (bandwidth/ availability) constraints. IITs, scaled to Corps HQ and certain Divisional HQs, contribute to manual image interpretation and change detection. SI, EW, and ELINT are doing a great job but have limited resources. Terrain and infrastructure limit the physical deployment of sensors and result in sub-optimally integrated surveillance feeds. Language acts as a prominent barrier whereas

proprietary modulation schemes/encryption is the other crucial area we need to be carefully looking at. HUMINT, SOCINT, and OSINT are conspicuous by their lack of presence.

So the way ahead should include an architecture which is inclusive. It should support a network-centric environment coupled with theaterisation of surveillance assets. Sensors must be resilient, smart, and the Internet of Things (IoT) based. There needs to be an increase in their numbers and enhancement in their performance. Auto geo-referencing and time stamping would be a major force multiplier. Standard sensor-interfaces with improved fault-resilience and better inter-operability could be another positive thing. Assured sensor performance at low temperatures could play a crucial role in achieving the desired objectives. Power supply issues for the sensors should be aimed at increasing battery life, high energy density, small form-factor power sources, etc. The packaging of batteries to survive environmental degradation is another thing that could contribute to battery life.

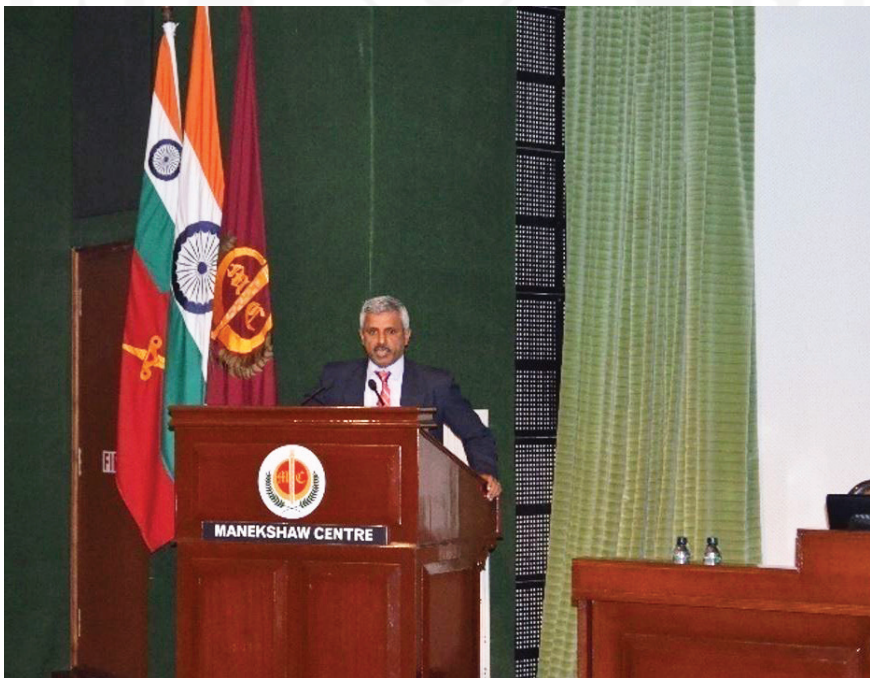

Plate 7: Brigadier R Balan, MCTE, Mhow

Sensors mounted on aerial platforms like UAVs, Aerostats, etc., is another step which needs to be examined and pursued. We also need to concentrate on the development of indigenous platforms, swarms, and satellite-based control-and-data relay as also graduation from GPS-dependence to the Indian Regional Navigation Satellite System (IRNSS). The ability to handle multiple payloads like ELINT, Communication Intelligence (COMINT), EW and Data Relay must be developed. With increased payload, greater endurance, stealth in all categories (mini, tactical, and strategic), secure control and data links, temperature-agnostic operation of UAV-mounted sensors, indigenous aerostats/balloons in areas with low wind speeds like radar, EW, data-relay payloads, definitive arrangements for exploitation of nonorganic assets along with space capabilities enhancement by creation of satellite-based ELINT (high resolution Earth Observation, hyperspectral, SAR, and IR-imaging) and data relay capabilities, which are major gap areas to be bridged and the status quo could be aptly altered.

In the domain of space-based surveillance, capability upgrade is required from occasional and sporadic surveillance to continuous operation, using a combination of LEO constellation and GEO satellite-based data-relay, with globally dispersed earth stations reducing the revisit and processing time. Capability for launch-on demand and capacity to build small satellites for ISR and positioning of "watchdog-satellites" to guard against inimical misadventures should be considered. We need to prepare for greater redundancy and survivability in the IRNSS for PNT SI, Early Warning and ELINT capability enhancement are other areas that require due attention, where the space platform is concerned.

Given Line of Sight constraints in mountains and the poor state of surface communication, greater focus is recommended on ESM and ELINT technologies, vis-à-vis, jamming and Direction Finder. Exploitation of low-cost, wide-band Software Defined Radio (SDR) for ESM/ELINT and Intellectual Property Rights (IPRs) of all standard and max proprietary modulation schemes should be bought out immediately on development. Focus should be placed on decryption, speech recognition, and language translation

technologies. These are areas where due exploitation of AI needs to be pursued. Existing capabilities of "Off the Air Monitoring" (OTAM) of mobile communication to be coupled with Tower-monitoring Low-Noise-Amplifiers for GSM/CDMA signal interception need enhancement. Equipment to monitor satellite communication needs to be augmented. HUMINT, SOCINT, and OSINT capabilities must be further cultivated. Existing politico-socio-cultural fault lines must be leveraged; and exploitation of AI for OSINT is a must.

Communication and Information Systems

Presently, the under-developed telecom infrastructure and linear brigade-forward communication with low link capacities and weak network resilience are quite rudimentary. Ad hoc arrangements exist for provision and maintenance of surveillance communication. In fact, it is divided between regimental signallers and the Corps of Signals; and yet neither of the two establishments is designed for it. We need to get our structures in place with immediate effect.

Legacy radio sets can scarcely handle surveillance data traffic and units are functionally ham-strung by Electronic Emission Policy (EEP) restrictions. It must be realised that there exists a finite limit to the quantity of cable which can be laid and maintained by any operationally deployed unit. By corollary, this precludes an-all-OFC based solution for the provision of surveillance communication brigade-forward. Information systems for processing of C4ISR inputs, Multi-sensor-data-fusion (MSDF), interpretation and analysis, and infrastructure in terms of Data Centre's are not available and need attention. In real terms, technologies for all of these exist. However, availability of resources, in terms of manpower and budgetary support is a sine qua none.

Communication. Wireless media can afford maximum flexibility; hence, must constitute the principal means between a sensor on the LC/LAC and the nearest telecom PoP. This entails the use of IOT-based sensors and leveraging of MCCS. Therefore, the revival of MCCS project and exploitation of Network-In-a-Box (NIB) to cover gaps becomes crucial. The corresponding review of EEP and enforcement of network access control must follow. Where wireless media cannot

meet connectivity requirements, low-capacity, light-weight, resilient OFC may be exploited. The proliferation of deployable terminals and mobile satellite communication handsets, with forward troops/ sensors in the TBA, must be given a fillip. Early roll out of IA-wide backbone telecom infrastructure is critical and a scalable bandwidth must be provided for, down to the sensor-end. Data compression techniques could be used to offset bandwidth criticalities.

Information Systems. Availability of a hardened server at the Battalion Surveillance Centre is a must for archiving/retrieval of data, and to enable subscription to feeds. It might also facilitate annotation on a Geographic Information System (GIS). Once sensors are duly networked, humungous volumes and variety of raw data will flow in at great velocity. The need for distribution of data lakes at regional and central data centres on the cloud (already catered for at Chandigarh, Jaipur, Kolkata, Lucknow, Udhampur, and Delhi, under Project NFS) with big data analytics capability for sense-making and server to come up for the edge is important. Adoption of Publish Subscribe Model of Data Dissemination and AI-based engines are fundamental requirements that need to be fulfilled.

Social and Cognitive Domain

Our own structures, organisations, entities, as well as the Processing, Exploitation, and Dissemination (PED) methods continue to be platform-centric. Unfortunately, both, the intra and inter-agency synergy and information-sharing is weak. Culturally, the philosophy of "need to know" rather than the "need to share" prevails. National level synergy and information sharing for border-surveillance are expected to address some of the most significant concerns. It entails partnership with Research and Development (R&D) establishments (DRDO and academia), collaboration with agencies of acknowledged competence (ISRO, National Technical Research Organisation [NTRO], ARC, IAF, SI, DIPAC, etc.), a strong defence industrial base, with scope for PPP, a mechanism and infrastructure for information sharing to be formalised with time-bound capabilities development plan taking all stake-holders on-board, steered by the National Security Agency (NSA), with involvement of the Prime Minister's

Office (PMO). Network Centric Tri-Service Environment for loose coupling of sensors across the services and the empowering of HQ IDS with a mandate for operative interoperability, coupled with a Steering Committee approach may help. An early promulgation of a comprehensive data policy and structural reforms are necessary to usher in single parentage for ISR aspect with the HR policies in terms of training, length of tenure, specialisation and cadre management, which need a review.

Way Ahead for the Command, Control, Communications, Computers, Intelligence, Information, Surveillance, and Reconnaissance in the Mountains

Near Term

- Stage-up telecom PoPs and surveillance bases as far as practicable.
- Prioritise the execution of NFS/ASCON Phase IV and MCCS; and the fielding of Mountain-BSS and BOSS.
- Train and equip regimental signallers for effecting resilient surveillance communication from sensor to Battalion HQ.
- Propagate the use of hardened servers at Battalion Surveillance Centres, with focus on data archiving and retrieval, data compression and error correction techs, and for efficient exploitation of available bandwidth.
- Institute procedural measures to ensure that different components of the surveillance network being executed through disparate projects/grants become co-terminus.
- Address concerns related to sensor-power-management and other technology-challenges through the ADB.
- Stream-line the interface of formation IITs with DIPAC to facilitate the flow of imagery data.
- Purchase corroborating satellite imagery and hire transponder bandwidth ex-foreign satellites, as a measure of redundancy.
- Conduct competitions amongst civilians and organise IA's annual

innovation melas on specific surveillance-related themes to tap into latent talent.

Middle Term

- Undertake comprehensive re-structuring to ensure single parentage for surveillance aspects, at formation level, with matching review of HR aspects.
- Incorporate measures for credible HUMINT. Task-specific agencies to build a mine-able SOCINT and OSINT database within acceptable timelines.
- Carve out a separate budgetary head for surveillance, as done for, say, SRE, through which all procurement aspects can be harmonised.
- Provide deployable capability for direct download of satellite imagery to all Corps HQ, in a phased manner.
- Ensure better coordination of regional Commands with units under DGMO and DGMI.
- Put in place mechanisms for better ISR synergy in the TBA with IAF, DIPAC, SI, and other non-organic resources within the three Services; which must be rehearsed.
- Strive to achieve gap-free AD radar coverage.

Long Term

- Undertake capability and capacity building in terms of heliborne, air-borne, UAV, aerostat, and space-based platforms through ISRO, DRDO, ARC, and the defense industrial base.
- Ensure inter-agency synergy and information-sharing with organisations beyond the three Services.
- Take up AI-based ISR and OSINT projects with tangible bite sized goals, through an empowered steering group.
- Lobby for border area telecom infrastructure development to be accorded national priority, to afford greater redundancy to mil telecom infrastructure.

SESSION II: RESHAPING OPERATIONAL ART IN MOUNTAIN WARFARE: CHALLENGES FOR INDIAN ARMY

The Chair brought out that, since in our case, there is no political aim given, no national security strategy is published; therefore, military leadership evaluates its challenges and plans warfare. Thus, in India, warfighting concepts and capabilities to execute are planned and trained for without any National Security Strategy, political vision or concurrence. There is a need to analyze the changes which have happened in the context of Indian Army's concept of fighting in mountains to include the aspects of newly raised Mountain Strike Corps and the optimisation of RR in conventional mountain operations.

Mountain Warfare in the Indian Subcontinent: A Paradigm Shift?

Mountains and borders certainly have not changed over the years. Borders at LC witness eye ball-to-eye ball confrontations, continuous firing, slogging matches, raids, and offensive. So has there been a paradigm shift at LC? In these contexts, not much has changed except some infrastructure has been built yet several sectors have not been connected.

But, some changes do have taken place. The old concept of "holders keepers" on LC, i.e. who captures the territory, it belongs to him thereafter, has got diluted after the Kargil Conflict. "Operation Vijay" changed the concept that LC has the sanctity of its own. If we are the holder of a territory at the LC, and the other side captures it, we are bound to recapture it. Kargil War laid down this changed theology of LC which is reflected in the fact that post Kargil there has been no concept of exchange of posts captured. Here lies the paradigm shift.

The Line of Actual Control, on the other hand, is not hot, not characterised by eyeball-to-eyeball confrontation. There are small contentious pockets which we are convinced in our territory. LAC is fairly stabilised though there are some non-demarcated or disputed

places that crop up once in a while. However, there has been a change in the quantum of troops since 2010. Aggressive patrolling coupled with a threefold increase in troops on the border in the last 10 years has certainly increased the possibility of more clashes taking place.

As we don't fight mountains we fight an adversary. Are there any changes in our adversaries? In the case of Pakistan, in POK, towards Gilgit-Baltistan side there are changes in demography and SEZs are coming up in Gilgit and Bimbar. Power plants are coming up in POK. In totality, areas under the CPEC project are witnessing changes. It can be concluded that, with so much at stake for China in Pakistan, the future conflict scenario for India is assuredly a "Two Front War".

As regards China, they have learned a lot from wars like the Kosovo War and the Gulf War, which they have tried to imbibe in their thinking process and strategy. They have learned that the

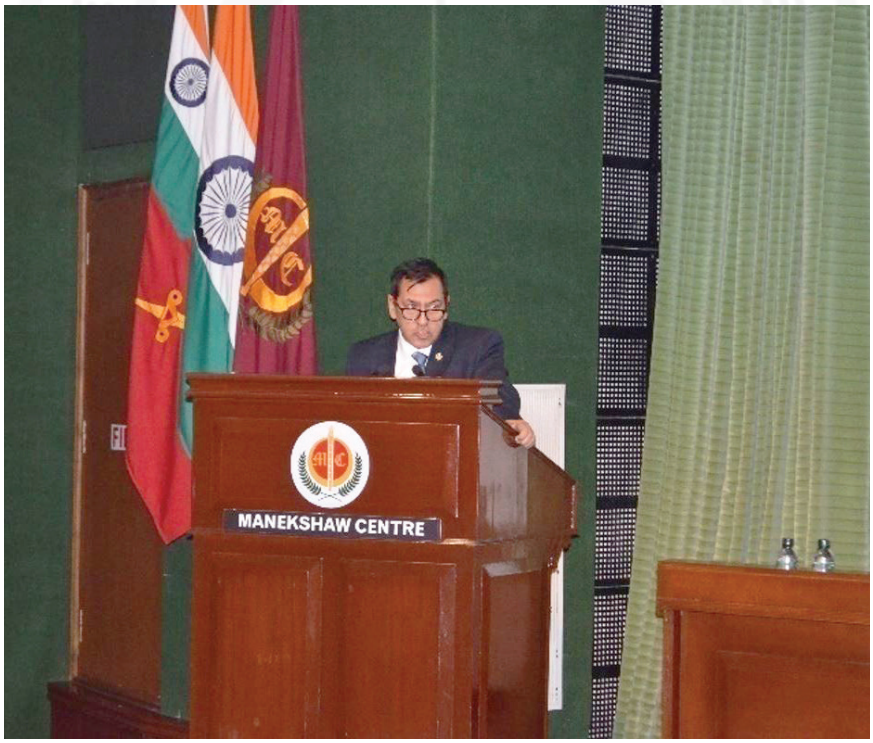

Plate 8: Lieutenant General Rakesh Sharma (Retd), Distinguished Fellow, CLAWS

annihilation of enemy on the battlefield is not a prerequisite for victory. Destruction of only military forces is less important than the destruction of opposing will. Thus, the thinking process in China on fighting, to include mountain warfare, is different.

Consequently, how China would undertake warfare across the LAC in mountains lies the major paradigm shift. Are Chinese aiming at capturing a few kilometres of territory that is disputed in nature and is that the warfare Chinese are looking for? Is that the actual bone of contention between India and China? Or are there geopolitical reasons for it? China is a growing power and wants to be the dominant power in the future. One of the theories of modern warfare enunciated by PLA is "System destruction warfare"—not centred at the destruction of enemy forces on the battlefield or at capturing of territory. The aim is to destroy the enemy's capability and their operating systems by kinetic and non-kinetic means—striking against key nodes. System confrontation is visible in many domains. The land is only one. Others are air, space, cyber, electromagnetic, and psychological domain to achieve absolute domination. The PLA's change is directed towards increased usage of directed energy weapons, robotics, hypersonic weapons, drone swarms, autonomous weapons, high-powered microwave which is non-nuclear EMP that can sizzle equipment, forcing India to fight medieval warfare, by crippling its equipment. The aim is to make the opponent lose his will and ability to fight by information dominance and precision strikes. Our capacity to counter such an attack is seriously lacking. We are not building our capacity at enough fast pace. We are not adopting the jargon of information warfare, autonomous weapons, and PGMs at a rapid speed.

We have to be prepared to fight the next war and a new adversary. That's the paradigm shift. The land is important for us as we are territorial-minded people. We have to be ready to fight hybrid warfare. We have to fight a different warfare on land. We have to match the fight our adversary is going to give us, not what mountain is going to provide. And we currently are not fully prepared to fight it.

Construing Future Challenges for Indian Army in Mountains and Measures to Mitigate Them and Concept of Mountain Strike Corps

The Challenges

The main challenge envisaged for India in the next conflict, whether with the Northern or Western Adversary, is of a "limited war" which is likely to be restricted to the mountains—the onus of escalation will be on India. Disputed Land will always be an issue but the next war is going to be limited, intensive, and different. The current orientation in mountains is totally defensive; the8 Mountain Division being deployed in the North and two divisions raised in the East is in a defensive context. We need to go beyond the concept of quid pro quo. Compulsions of ongoing proxy war are affecting our capability in fighting mountain warfare. Another challenge is collusion between China and Pakistan. It can manifest itself ideally in Ladakh, which is naturally isolated by the great Himalayan Range, physical proximity to both adversaries and gives an opportunity, especially to China to develop its combat potential. Our biggest challenge is terrain. The Northern Border is divided into five mutually exclusive Sectors—Ladakh is separated from the Central Sector by the Great Himalayan Range, The Central Sector is separated from Sikkim by Nepal, Sikkim is separated from Arunachal Pradesh by Bhutan, and within Arunachal itself Kameng and the Rest of Arunachal Pradesh (RALP) has the Siang Gorge. We are on exterior lines and seamless laterals are not possible. Our mobility and deployment of troops including for offensive have to be looked at in this light. Tibet has a distinct advantage as reflected in how Chinese have built infrastructure there. Infrastructure, location, and height (acclimatisation) are going to be important for the placement of reserves.

The Way Forward

The rapid transformation of PLA and infrastructure has resulted in a capability gap increasing. We have put together a Mountain Strike Corps but its structure requires a paradigm shift for ensuring effective and optimum response to eminent "Two Front Mountain War".

So, what is the way forward? We need a realistic professional analysis of the limited war in mountains and collusion so that we can build a credible response strategy. We need to think offensive in mountains from Force Structure to Infrastructure and in terms of our roads reaching LAC to provide options for our offensive elements. We are still believing in the concept of last war and that's why the focus has remained only on increasing numbers. Our strategy and response need to be a—"DOTS Response". Build a Doctrine, put in an effective Organisation, and bring in Technology and Strategise the response. The Bottom line is to build capability and reorganise to showcase a credible offensive intent.

The Mountain Strike Corp

Mountain Strike Corps should become a catalyst to change the way India fights the next war. A paradigm shift in the way it is

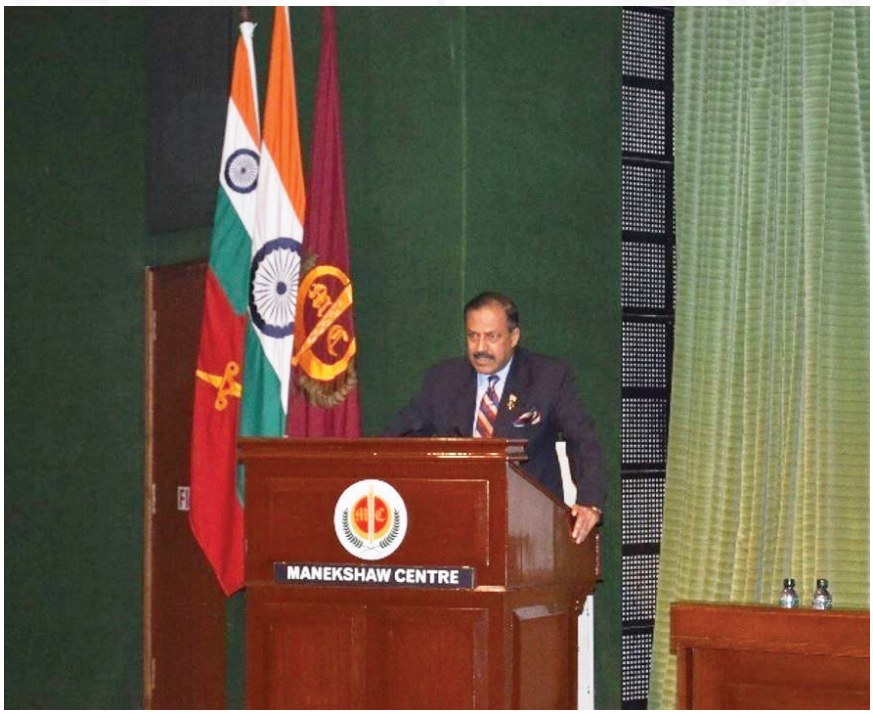

Plate 9: Lieutenant General RJ Noronha (Retd),
Former COS Southern Command

seen and restructured to fight the next war is required. It should truly become an instrument of transformation from Dissuasion to Credible Deterrence. It can act as a punitive deterrence in mountains on the Western front. Today, it is not yet a threat to our adversaries in terms of its structure and training which needs to be restructured to transmit an offensive intent. The focus in the future should be to translate the concept into action. The answer again lies in "DOTS Response". Reorganise in a way that the new structure is disruptive, like the RAPID which changed the way of offensive in plains.

Restructure into RAMID/IBG, define a concept of Air-Mountain Battle in our context and put the Air Assault Brigade with integral helicopters. We need to transmit an offensive intent by taking the battle into the enemy territory. For this, we need a paradigm shift in thinking in our Army that will ensure the Mountain Strike Corps truly builds up as an Instrument of Credible Conventional Deterrence.

Optimisation of Rashtriya Rifles in Conventional Mountain Operations

The focus of the Indian Army for mountain warfare is primarily placed on—no loss of territory, the requirement of reserves, higher combat ratio, innovative minds, and physical fitness. All of this is encompassed in RR. There has been an increasing emphasis on the need to change the mindset. However, these can be already seen imbibed in RR troops, as they are bold, offensive, fit, and innovative due to being in continuous operations. This is the paradigm shift we need to bring in our troops for fighting in mountains. Resultantly, RR can be readily employed in conventional operations; however, they lack operational training for a conventional role and are also currently deployed in penny packets in the counter-terrorism grid.

Looking at some facts—RR comprises 63 battalions and each with 6 companies. This means it is equivalent to 94.5 infantry battalions, 15 sectors, 10.5 divisions, 3.5 corps worth in terms of quantum. It is important to remember these figures because for all our future wars we would be confronting a "Two and a Half Front", wherein "Half" being the proxy content. Hence, there lies the need to optimally look at RR for numbers. It's a wild card.

When RR was raised, the US, China, Pakistan, and global strategic thinkers wondered how and why India raised such an innovative force, drawing soldiers from different battalions. This force is a lethal weapon and has strengthened the Indian Army for conventional as well as sub-conventional threats. RR is heterogeneous, has a strategic orientation, and by default it is always looking at Pakistan and its proxies. They are always combat ready, they are battle inoculated, baptised for mountain warfare, and are key to the strategic redirection of the operational arena in mountain warfare. Mountain warfare is all about operating in small groups and RR works that way. They can do wonders as they are already acclimatised and physically fit with several troops incorporating it, volunteering for the second and third time.

The planners should not falter in taking RR in their scheme of things while planning for mountain warfare. They are a force multiplier and should be used effectively. They are achievers and should be deployed accordingly. They are best suited to be deployed

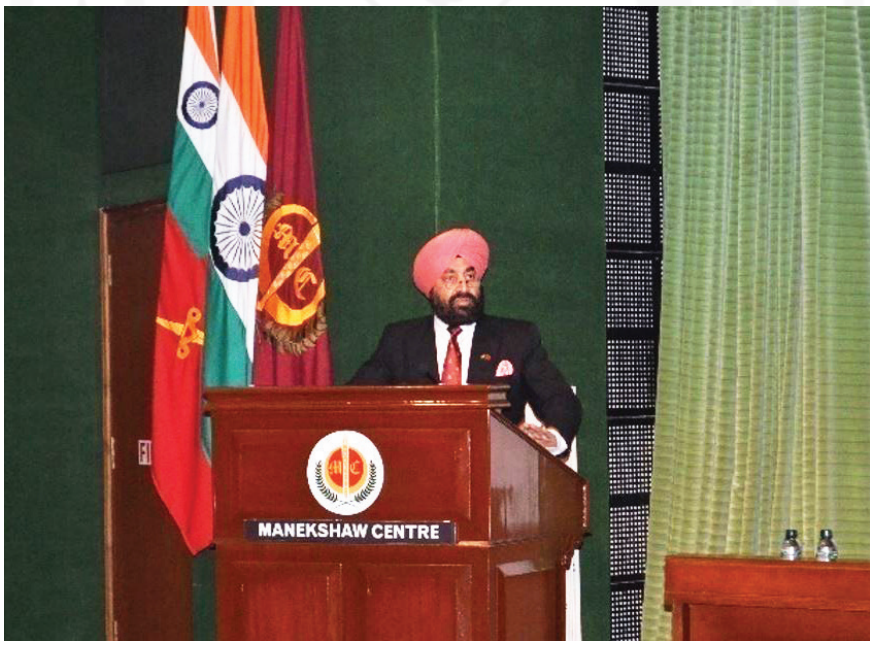

Plate 10: Lieutenant General Gurmit Singh (Retd), Distinguished Fellow, CLAWS

as a support to regular/conventional offensive forces. In fact, they can be used in the strategic domain, as a strategic surprise.

The challenge which can be visualised is that their effective employment in mountains would be impacted by their organisational structure which is 50 percent infantry and 50 percent other arms and also their limited training for conventional operations. Thus, the option is to identify those RR battalions which can be employed straightway in the conventional role because of having a greater percentage of infantry. These Battalions should be provided with conventional training, when required, utilising the Corps Battle Schools (CBSs).

The balance of the RR Battalions can be suitably utilised in their present task to counter the proxy threat which would concomitantly loom during the conventional operations also. They can also be befittingly used for consolidation tasks during the conventional operations as our operational success will be defined by our capability to consolidate captured areas which generally pose a management problem. RR can change profiling of reach and depth of offensive and can assist our offensive forces for reaching deeper termination point.

It is high time we start thinking of RR as a complementary offensive force and not look at it as a reactive force or merely as an HR package.

SESSION III: DECODING FUTURE MOUNTAIN OPERATIONS IN THE INDIAN CONTEXT

The Chair in its opening remark brought out the fact that, in the Northern Command, we have to plan for winters. Ladakh gets totally cut-off during winters from our side and we should look at warfighting and mobilisation in Ladakh during winters. Fighting in mountains is a complex warfare and India has the widest spectrum of experience in mountain warfare. This experience ranges from wars in 1947, 1962, 1965, 1971, and 1999 to Operation Meghdoot in 1984. Global experience shows that the US and Russia have struggled in

this warfare in Afghanistan. The lesson which emerges from India's experience in mountains is that firepower is the key component in combat power. But, we can't move, we cannot see, can't deploy and no gun shoots to the methodology. In mountain warfare, no gun would shoot where you want it to shoot or no gun will fire to the fire table. This frustration is faced by even the US which boasts about its technological prowess. Therefore, directing this fire by means which are technology driven or HR driven will have the key to the efficacious delivery. One way of looking at mountain warfare in today's context is looking at from three aspects of, delivering synergised firepower, round the clock surveillance capability, and the ability to innovatively use the force multipliers like SF.

Synergised Firepower and Air Land Considerations in Mountains and Prospective Concepts in Special Forces Operations

Will to fight is the hub of all defence mechanism.
Look for ways to "break his will" and "capacity to resist"
Brigadier General HubaWass de Czege

Operations in mountains are troops and time-consuming which are contingent upon the increased magnitude of terrain and enemy friction. Therefore, isolation of the battlefield and shaping of the targets have to be IPB driven. Limitations in the movement of rotary wing aircrafts and night surveillance capability are still a persisting problem in mountains.

Other limitations like time-consuming counter actions, movement of guns to the border causing lower densities, and near absence of precision inventory further compounds our war-waging capability and effectiveness in mountains. One cannot strike till your databases are right for which surveillance means including men and officers on the ground. This is of paramount importance.

Resultantly, it has become imperative to qualitatively upgrade our communications, logistics, MET systems, ammunitions, and training which are critical for fighting effectively in mountains. Aspect of AD in mountains is extremely important and primary for survivability.

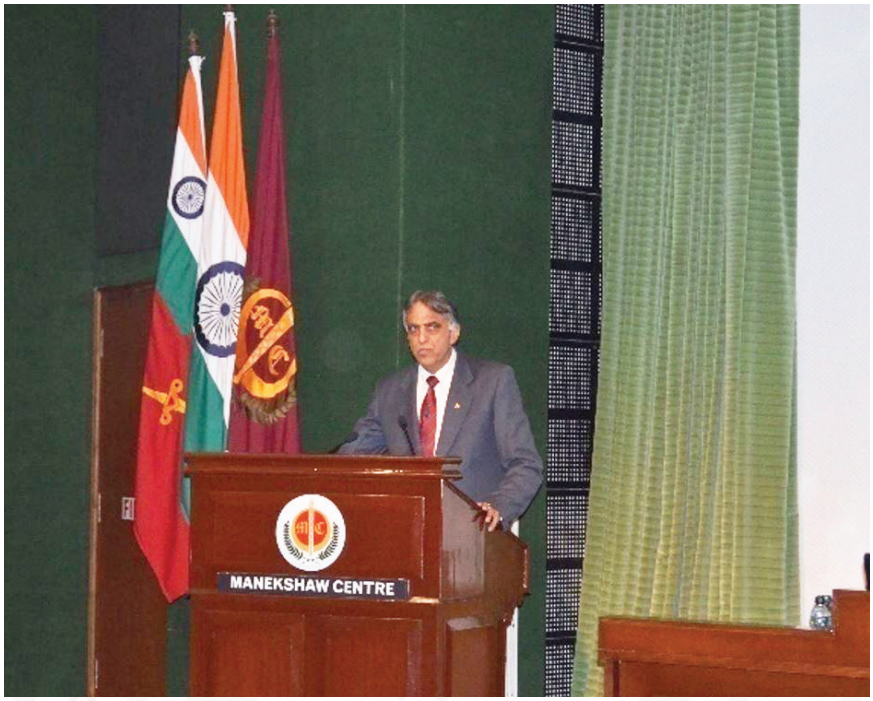

Plate 11: Lieutenant General Vinod Vashisht (Retd), Former DG NCC

In the case of rotary wing efforts, the following merits consideration:

- Security of Mounting Bases: Criticality of AD and enemy artillery. Counter measures, therefore, be catered for.
- Weaponisation is an important aspect requiring attention.
- Understanding of ground nuances by pilots and operators is a prerequisite.
- Prowess of vertical envelopment.
- Enhancing night flying: Moral ascendancy.

In terms of fire power if we consider the present state of PLAAF and their likely employment philosophy against India, then the following emerges: Modernisation.

- Shifting of orientation from defensive to offensive and defensive according to DWP 2015.

- Steady increase in the 4th Generation Fighters.
- Modernisation across the entire spectrum of PLAAF
  - Su 30/Su 35: Air Superiority aircraft (ac) J-20: Stealth Multirole acY-20: Strat Airlift transport acH-6/H-20: Strat Bomber (H-20 under development) Modernisation of AWACS, EW, and AD equipment

Employment against India.

- Limited Airbases at HAA
  - Restriction in lift capability
  - RoA of vintage ac
- Availability of ac in WTC
  - Approximately 300 Fighter aircrafts
  - Approximately 60-80 AHs (WZ-10/WZ-19)
  - Number of sorties per day—400-500
  - 07 X airfields likely to be employed against India

Employment Philosophy

- Enhancement of AD Capability
  - Long Rg Wpn Sys viz S-300 (Rg 300 km) held and S-400 (Rg 400 km) being procured
  - Short and Med Rg AD systems to allow ground forces to operate with impunity (HQ 16B – 70 km; FM 3000 – 30 km)
- Quantitative and Qualitative Enhancement of AH Capability
  - Indigenously built WZ10 and WZ 19 introduced in service
  - Aim to destroy adversary's Mech Forces, piecemeal, prior to the launch of operations
  - Complement PLA Mech Forces to mop up with least boots on the ground
- Capability to Sustain Air Sortie Generation
  - Indigenous capability to beef up production
  - "As required" supply from the hinterland
  - Prolonged operations will tilt ratio towards PLAAF

The employment of SFs at present is very tactical, although we do not have a global role or ambition. We need to look at how we can employ this force strategically. The probability of a conventional war in today's times is low; however, larger strategic considerations would be taken into account when engaging in any type of warfare. In a conventional domain they are best suited to create a wedge between troops in contact and administration echelons/reinforcements; disruption—degradation and delays in proximity and in depth.

Recommendations

- Mutual comprehension of the nuances of enemy, joint operations, and joint training
  - Requirement of IAF representatives down to Brigade level
  - Secured Intra Service Communication—DCN down to Corps level
  - Joint imagery analysis capability
  - Joint training at tactical levels
- Integral versus integrated capabilities of Army and IAF: The capability of weaponised rotary wing effort, AHs, and medium range battle support lift should be integral to the Army as it was unfortunate that only 240 troops could be air lifted during Kargil operations. Strategic lift and Air Support ability need to be with IAF.
- Arty Application

Performance Limitations	*Optimisation Catalysts*
Gun density and weapon choice	• Mediumisation • Rockets: Effective on area targets • Light Arty important
• Surveillance and Target Acquisition • Accuracy of Fire: Despite the predictability • Counter Fire measures	• UAVs: High-Altitude, Long-Endurance (HALE) with Satellite Communication • Wind effect: Smaller UAVs • Stay behind/SF/Human-int • EW integration
• Survivability • Space Management: Autonomy of the Movement	• Infrastructure • Air Defence • Counter Fire measures (SWATI—HAA)

• Ammunition handling and reliability	• HAA—RTs • Tunnels - Storage • MHEs
• Communication • Precision Inventory	• Refine Communication Philosophy • Precision Inventory a must (Learn from Krasnopol Experience)

- Satellite Surveillance
  - Enhanced availability with compressed timelines (operated through DSCC and interpreted at DIPAC)—by day/night or any weather is a must.
  - Transmission of output ex DIPAC at ground stations in each Corps, as a minimum requirement, is imperative along with connection to Surveillance Centres
  - One mobile terminal per theatre; for operations beyond borders
- Surveillance by Other Means
  - UAVs—HALE versus Medium-Altitude, Long-Endurance (MALE) (Ceiling height and jet stream effects)
  - Handheld UAVs, though their effectiveness has certain limitations
    - Crew for 24 × 7 operations—a major limiting factor
    - Cloud penetration
  - All electronic and electro-optical devices as one entity
- Artillery Communication Philosophy for Mountains
  - OFC/RR-based transmission to Battalion Commander is a dire need
  - Equipment for offensive/stay behind with Citizen Band
- Miscellaneous Force Multipliers
  - Air Defence (SAM Based) for critical targets: Mounting bases and prime targets
  - SWATI (HAA) need for enhanced numbers
  - Precision Inventory: Independent and joint with Air Force (Designation incorporated)

- Ammunition Storage—Infrastructure
  - Effect of weather and survivability—Tunnels
  - Handling/Replenishment—MHE
- Firing Ranges
  - Guns of Hill/Mountain Sector need adequate and relevant ranges for practice.
  - Review ranges in every Army Commanders Conference. On one side, Mediumisation of Guns is underway while on the other hand, the firing ranges are shrinking.
  - Search for new ranges, not compromising manoeuvres and trajectory management—minimum 2 X firing areas and hill shooting are required to be catered.
  - Ranges for Air Force in mountains—Joint practice with Army.
  - Need to go beyond IAF simulated firing with an audit.
  - Ranges for Mech Forces is needed.
- Special Forces
  - Need to train in utilisation of firepower assets including air
  - Be part of Nano-technology utilisation—lightweight equipment and weaponry—Investment necessitated on an immediate basis
  - Enhancement of staying power, communications, and survival

Confronting Infrastructural Challenges

There is a need to have a concerted focus on the infrastructure differential between China and India. One such example of disparity is Tibet, where China has constructed 24,000-km long road in 5 years from 2012 to 2017 and has extended the same further by 6,000 km in 2018. There has been extensive use of cement-based production, especially for connecting villages and towns. Also, they have laid down further plans for connectivity with an aim to connect 80 percent of villages and 100 percent of townships by 2020. As regards railways, the 2,000 km Tibet line which crosses the highest point, the Tanggula pass at 16,000 ft. is likely to be extended to LAC by 2020. Some other infrastructural developments include 20 airfields in

and around Tibet and another 10 new airfields are in the pipeline. In totality, they are upgrading all their highways, resurfacing them up to the LAC, upgrading their airfields, constructing new heli-bases, all the airports are being connected with four-lane expressways, seven new rail lines are being laid, high-speed rail being constructed from Chengdu to Xingding which would reduce the travel time from 13 hrs to 3 hrs. The rail-road capacity of China is about 30,000 Mt a day with an induction capacity of around 29 divisions in 30 days.

There are some plans laid for Himachal Pradesh, Uttrakhand, and North-eastern region of India. We are about 40-50 mi away from LAC in Himachal Pradesh. In Uttrakhand, we are reasonably well in the Joshimath and Harsil sect but need more effort in Sawagargh section wherein we are about 70 km short from LAC and expect to achieve it in the next 2 years. In Sikkim, our infrastructure is good. In

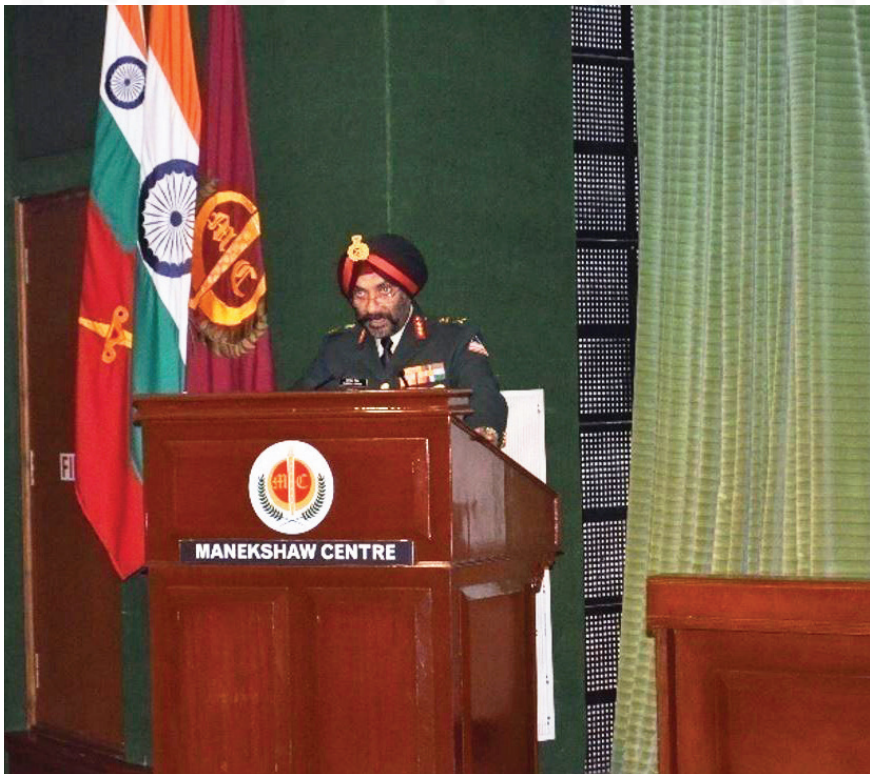

Plate 12: Lieutenant General Harpal Singh, DG BR

Western RALP, we have a huge differential but by 2022 we are likely to complete. In Eastern RALP, the differential is about 60-70 km and this area also would improve by 2022. The primary reason for these voids was India's defensive strategy post-1962 war. India's airfields being in plains do have a distinct advantage but we need more helibases and airbases closer to the border. The nine strategic railway lines are still on the planning table but, are likely to commence soon. In most of our sectors, we lack all-weather connectivity with around 4-6 months of their non-availability in a year.

Integral connectivity, i.e. inter-valley connectivity is a major issue in Arunachal Pradesh. We possess a major disadvantage in the operational window as of now as the Chinese have a window of Eight Months while we have a window of only Four-Five Months. So, the only answer lies in overcoming these challenges by having an operational rationale and in identifying the criticality of sectors, which we have already done and roll-on works plan are being formulated. Land and forest issues and requirement of high-end technology are some of the aspects hampering the pace of road construction.

In case of forward connectivity, in the Northern and Central Sectors we have a total of 31 Indo-China Border Roads (ICBR) out of which 28 roads have been connected while in Eastern Sector, out of the 30 ICBRs, 27 stands connected. Out of the total 3,100 km, 2,300 km has been completed and the balance of 8 km is likely to complete in the next 2 years.

In case of the current status of the Northern border, the issue is not of the capacity or capability of the Border Roads Organisation but, is the non-availability of proper funds. However, with the intervention of the highest offices, we have been able to tap the resources of other ministries which is likely to make a substantial difference. On the Western fronts, India has a new alignment of Akhnoor-Poonch. There are four forthcoming tunnels thereby shortening the distance by 40 km. In Leh-Ladakh region, a number of alternate routes have come up in the last 5 years. However, the main focus has been on road from Srinagar to Leh which is yet not an all-weather road but, the work is going on "Z" Mor and Zojila Tunnel. Snow galleries

are being made to make this road an all-weather. The second road is to Leh from Manali through Rohtang tunnel which would take a long time to make it an all-weather. The construction of three major tunnels totalling to 33 km with an investment of Rs 400 cr per km are also forthcoming. Rohtang tunnel would be the highest tunnel in the world (made at 10,000 ft) and dedicated to the nation by October 2019. Presently, as Rohtang road will take time for becoming all-weather, we are going for Padam-Nimu axis. Padam is connected to Kargil and the remaining connectivity would complete by 2019. The most important road being DS-DBO road is 170 km with 33 bridges and is half-completed and the balance will be completed by May 2020. There is a necessity to connect Northern Command and Western Command through road Sungdo-Sansari-Kishtwar-Doda for and "in principle" approval has been given for the same. Many border roads under project "Bharatmala" are coming up in Sikkim and Uttrakhand which would be "game changer". In Arunachal Pradesh Baribara-Chardwar-Twang road, 317 km long, was in a bad state and is now being double-laned and being made all-weather. The PDC is by 2022. In February 2019, Sela Tunnel work will start. For Inter-valley movement in RALPH Area—Naphrato Vijaynagar, about 2,000 km, funded by Ministry of Home Affairs is likely to start. Under water tunnels are in pipeline to connect North and South banks of Brahmaputra River which again would be a "game changer". Adequate budget support is being given by the Government. We have received a 40 percent increase this year and we expect to double the same by 2020.

Operational Logistics: Current Challenges and Way Ahead

The battlefields in the modern-day world are quite transparent, which makes it extremely important to know about the enemy's installations. In any battle, the two most vulnerable things of administrative nature are Ammunition and FOL. A large chunk of FOL is underground and dispersed (at least in 14 Corps). But, the vulnerability of ammunition storage is still a challenge. In mountainous terrain, tunneling on the reverse slope of the hills seems the apt answer by which we can have safe logistic installations in the forward areas. Another important

aspect is the need to focus on improving our axis of maintenance at many crucial places as they are not operational for the most part of the year and with non-availability of any alternatives, the situation gets more critical. The capacity of the roads to carry a heavy load is also limited which causes extra wear and tear on vehicles.

Another important issue is of environmental degradation of such regions for which the Sustainable Economic Development could be an answer. Due to increasing tourism and a growing civilian population, the fragile Himalayan environment has been deeply affected. Floods in Leh, global warming, and climate change are clearly the effects of the environment abuse. Efforts need to be undertaken at elementary levels to offset environmental hazards caused due to the creation ofartificial spaces. An "Industry-Military-Civil Cooperation" could help in creating an economic model in the Himalayan region for the efficient utilisation and exploitation of local resources. A recently

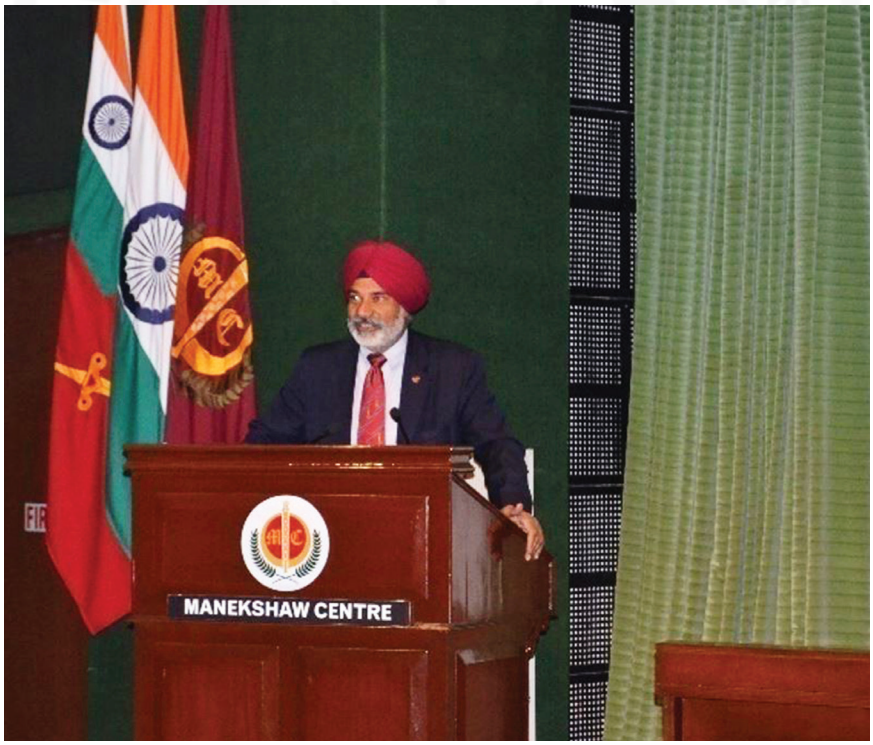

Plate 13: Lieutenant General Balbir Singh Sandhu (Retd), Former DG ST

established University in Leh though focuses on utilisation of local resources, but more needs to be done at industrial and academic levels.

The issue of human casualties which primarily occur due to altitude sickness requires to be dealt with different diet and living patterns. Vehicles and ammunition are equally affected. Although a number of Class A vehicles have been inducted in the mountains in recent years, their maintenance has not been ratified by any institutional mechanism. All of it is on an ad-hoc basis which requires immediate attention. While on one hand, idle running needs to be done, on the other hand, after certain hours the engine needs to be changed. Problems as to how should the engine be changed, right there or taken back, arise. The only way to make the engine usable at high altitude is to add more kerosene to it and add lubricants so that the engine doesn't get damaged. Another problem that arises is what if the lubricant freezes? It causes further more damage to the engine. Thus, the need to institutionalise methods of doing this is pertinent. Instead of moth-balling, cocooning could be used to protect engines of the vehicles.

Stocking is another extremely important criterion for fighting in mountains. During procurement of this stock, it is aimed and planned that the procured stuff should last for over a year of procurement for which emphasis must be laid on better methods that can aid advanced winter stocking. Since surpluses are as dangerous as shortages at the formation level, it is important to ensure that such situations are taken care of.

A tailor-made logistics for each sector of the Indian Army, which fits the requirements of each sector, must be worked upon. Economic development following the Chinese model of "a strategic thought with an economic dividend", implemented in the TAR, which is advertised for tourism instead of propagating strategic relevance, should be a considered model worth replication at home. The development of infrastructure in border areas, therefore, must be done with an economic thought along-with not compromising on the strategic requirements. For example, if a wide road is built for a tank

transporters movement but is used rarely, then we can have small scale industrial townships using these roads, which are eco-friendly and those which can sustain the local population. All money, after all, cannot be spent only for strategic purposes.

The use of technology in the Indian Army for logistics is extremely limited. By the time the technology is introduced, it becomes obsolete elsewhere. An interface between the civil and the Army is another major requirement. Interestingly, between transportation and technology, in civil, while transportation is assumed as given, technological penetration holds extreme significance. Although a certain degree of security is required in combat zones, yet technology penetration is certain like other sectors which could aid in enhancing the overall efficiency.

The importance of the development of rail, road, and air infrastructure should be the primary economic as well as strategic goals in forward areas. Laying down of pipelines from the hinterland to Corps Zones might be very uneconomical; however, pipelines within the Corps Zone, to the forward areas with sizeable troops can be a viable option. The concept of totally autonomous vehicles (Tesla is being thought of in abroad and can be taken as an inspiration by the R&D teams at home too.) are important aspects that can be looked at as means of technology penetration. Animal transport, on the other hand, must be owned as per the requirement in forward zones. Along with large-scale technology advancement, indigenisation is certainly a fundamental prerequisite for economic reasons.

CLOSING REMARKS

There are shifts in the concept of "National Security". While the traditional threats include territorial integrity but in the post-cold war scenario, non-traditional threats surrounding national security have started emerging and gaining prominence. However, boots on the ground will retain their significance in the mountainous region till the time battlefield transparency by means of ISR is achieved. The high incompetency in terms of technological competence at home is

a worrisome fact as the character of conflicts keeps changing due to technology. A Chinese professor, at an academic event, once claimed that the Chinese PLA would reach mechanisation by 2020 and informationisation by 2035. On being asked about the surety, that the desired goal would be achieved in time, he promptly replied that the efforts for the achievement of the goal are being taken on four fronts. The educational standards to higher levels even for sailors and the soldiers that are hired have been raised. National defence universities of Science and Technology in which all the recruits and serving officers have to undergo training have been established. The officers are drawn from these universities and hence their technology thresholds are much higher so the absorption of technology takes place. Also, Original Equipment Manufacturer (OEM), when they make a prototype and it is fielded to a unit or a field formation, the OEM representative continues to be attached with the equipment so that any defects noticed by the users are taken care of.

Absorption of technology, is therefore, just as important for the logistical success of the Armed Forces. Innovation is equally important. Low-cost technology is required at the level of battalions and brigades. Tackling a hi-tech adversary in the North with hybrid warfare capabilities and a low-tech adversary in the West, yet indulging in proxy war and sub-conventional operation along-with information warfare and propaganda war; the paradigm shifts in the capabilities of the adversaries thus must be taken into consideration and a comparative analysis of our capabilities at home must be timely done. The weakness of surveillance is another aspect that must be paid attention to.

China-Pakistan Economic Corridor and Chinese interests in Gilgit-Baltistan suggest collusion of Indian adversaries. Chinese studying the Gulf War of 1991 and the Serbia-Kosovo conflict of 1998/99 has led to their realisation of the importance of extensive use of air power, SFs, precision-guided munitions, ISR capabilities to provide battlefield transparency, and space-based technology. They decided on four actions—force mechanisation which they want to achieve by 2020; informationisation which they want to achieve by 2035, and theatrerization of the seven military regions which they

have completed in February 2016. Now, one theatre looks after our complete border with China whereas we have four commands, three Air Force commands, one SFC, i.e. eight commands to look after the same theatre. They have the unity of command, the unity of effort, and the unity of purpose to take action quickly with situational awareness and faster decisions. It's time we also look at our jointness and integration in a time-frame to do it now instead of doing it afterwards in operation. The core capability of each service must be respected and be given their due and thus the integration must remain a part of our thought process for real achievement on the ground.

CONCEPT NOTE

Preamble

It is a well-cited fact that throughout the course of history, armies have been significantly affected by the requirement to fight in the mountains. With approximately 38 percent of the world's landmass classified as mountains, it becomes desideratum for the forces to be prepared to deter conflicts, resist coercion, and defeat aggression in mountains as in other areas. Mountain combat calls for extreme physical fitness, mental toughness, endurance, and the utmost in tactical and technical proficiency. Conducting military operations in mountains or cold weather environment is complex and challenging as the fighting forces encounter two enemies, namely, the environment and the opposing force. Despite these adversaries, there are armies that have and can conduct large-scale, sustained operations in the mountain.

It is an absolute certitude that wars are not fought without a geostrategic military context. In the Indian subcontinent, geo-strategic challenges emanate from the ongoing conflict in Afghanistan; territorial disputes of India with China and Pakistan; the growing China-Pakistan ballistic missiles-military hardware development nexus; and, the almost unbridled march of radical extremism that is sweeping across the strategic landscape. In the Indian realm, Pakistan and China are two continental perennial threats, which when escalated would surely flare up in the domain of mountains.

Changing Attributes of Mountain Warfare

Mountain and high altitude present specialised problems for military operations. The complex terrain restricts force employment and deployment, creating difficulties in mobility and manoeuvre. Greater challenges are also anticipated in terms of stress on personnel and equipment, increasing non-combat losses, as well as magnified maintenance and repair requirements. Over the years, mountain warfare has undergone a mutation with asymmetric tactics; greater

use of precision strikes; and air, space, and information superiority gaining prominence for achieving increased operational tempo.

Special Forces and specialised equipment offset difficulties in both defensive and offensive operations in mountainous terrain. Dynamism in the insertion of airmobile and SFs into the enemy rear area would substantially enhance the support to frontal ground force, seize or destroy key targets, underpin the joint fire strike, and effectively interdict enemy forces.

Prospect of information superiority in the future battlefield will be overriding and would remain the most potent weapon, critical for conducting successful operations in mountains. Information attacks, electronic and psychological warfare would be its inevitable components. Secured and assured communications to support dispersed units will be pivotal while continuous reconnaissance and meteorological support for situational awareness and targeting would be ineluctable.

Logistics is indispensable and vital to a force, but when inefficient it is a constraint on that force's freedom to manoeuvre. Any Army that continues to operate with a logistics system designed for one environment, but operating in another, is bound to incur economic inefficiencies and operational ineffectiveness. Most of today's military face such a situation.

Challenges in the Indian Context

The Indian Army, considered as among the best-trained army in this warfare, maintains one of the largest active contingents of mountain warfare forces in the world. Due to instability in the region and hostile neighbours, India requires a permanent deployment in its mountainous regions. Consequently, it possesses the most extensive and well-developed mountain warfare capabilities. Though the probability of conventional conflict in the Indian sub-continent remains low, its possibility cannot be ruled out. There is a fairly high probability that the next conflict between India and Pakistan remains confined to mountainous terrain.

India has come a long way since 1962 conflict as India's mountain warfare units were vastly expanded after the 1962 war, with the creation of six Mountain Divisions. The quasi-conventional Kargil Conflict, which became the only modern war in the world that was fought exclusively in mountains, brought forth a large number of lessons; questioning the very basics of Indian mountain warfare capability. Now 18 years hence, the question still lingers whether the Indian military's present operational concepts, equipment profile and capacity to sustain operations in mountains are sufficient and suitably tailored to face the evolving battlefield challenges? To examine this, there is an inescapable requirement of revisiting the future threats and challenges and accordingly build proportionate military capacities and capabilities. In order to address the multifaceted challenges we need to answer the following questions:

- Mountain Specific Military Strategy.
  - Do we require a mountain specific military strategy to meet the threats as envisaged for the future?
  - In an extremely difficult and inhospitable terrain, how can manoeuvre be used to our advantage?
- Upgradation of Firepower Capabilities.
  - Have we carried out an audit of our firepower capability specific to our mountainous terrain?
  - What actions can be taken to enhance the orchestration of firepower to strengthen operations in mountains more effectively?
- Vertical Envelopment and Heliborne Capability.
  - Is India's capability for vertical envelopment and heliborne assault too inadequate by modern warfare requirements?
  - To achieve mobility and for outpacing the enemy, does helicopter lift within divisional and brigade sectors needs to be enhanced?
  - Is there a need for "air assault" formation sat "operational level" for vertical envelopment in conjunction with SFs?

Air Operations in Mountains. Though the battle in the mountain will remain Army predominant operations, no future war plan would succeed without achieving massive asymmetries in the application of synergised firepower. Operationally, has IAF leveraged all its competencies and exploited its wide range of capabilities to address the lower end of the conflict spectrum and warfare in mountains? How are the air operations likely to unfold in future battlefield milieu in mountains and what have been the changes after the Kargil Conflict?

Joint Integrated Theatres. Integrated Army-IAF operational plans to avoid incongruent thinking and duplication are the order of the day. The success of any operation in mountains would eventually impinge upon seamless and fully integrated Army-IAF operational plans which have been jointly evolved. How can we further integrate for achieving meticulous coordination and flexibility to exploit the fleeting opportunities? Are Joint Theatre Commands a need of the hour?

C4I2SR Capabilities. Indian C4I2SR capabilities are still rudimentary and need substantial modernisation to exploit the synergies that can be achieved by a network-centric force. A seamless intelligence-cum-targeting network, to fully synergise the strike capabilities of air and ground forces in real time, seems inevitable in future battlefields.

Logistics and Infrastructure

- Mobility in mountains is a keystone. But mobility is greatly limited to the extent that the logistics system constrains it, particularly with the requirement of co-location. Does the complexity of modern-day logistic support suggests that India's need will be best served by an integrated logistics system?
- The absence of good infrastructure, including all-weather capable roads, further compounds the "logistician's dilemma". Have the Infrastructural developments along the northern and eastern borders failed to keep pace with the army's ability to fight forward, thus needing an impetus? What needs to be done to

optimise our infrastructure capabilities in both the short and long term?

Training and Specialised Equipment. Mountain warfare being a specialist field with its own characteristics, requires specialised training and equipment for the soldiers. Is there a need to take a De-novo look at our equipment profile and training to align them with changing battlefield scenarios?

Objective

The objective of the Seminar is to carry out a broad-based analysis of prevalent warfighting capabilities of the Indian Armed Forces in mountains and bring forth coherent suggestions to improve their effectiveness in mountains with the changing battlefield milieu.

Conduct

The Seminar was conducted in three sessions as under:

- Session I. Changing Attributes of Warfare: Future Contours and Trends
  - Prospective Security Environment and Changing Character of Warfare
  - Air Power in Mountains: Future Challenges and Responses
  - C4I2SR Capability: Need for a Realistic Approach
- Session II. Reshaping Operational Art in Mountain Warfare: Challenges for Indian Army
  - Mountain Warfare in Indian Subcontinent: A Paradigm Shift
  - Optimisation of RR in Conventional Mountain Operations
  - Construing Future Challenges for Indian Army in Mountains and Measures to Mitigate Them and Concept of Mountain Strike Corps
- Session III. Decoding Future Mountain Tactical Operations in Indian Context
  - Fire Power and Air-Land Operations in Mountains: Infusing Synergy. Prospective Concepts in SF and Helicopter Borne Operations

- Operational Logistics: Impending Considerations and Way Ahead
- Confronting Infrastructural Problems

Miscellaneous Details

- Participants. The participants were from the Armed Forces, strategic community, veterans and academia
- Venue. Ashoka Hall, Manekshaw Centre, New Delhi
- Seminar Coordinator. Colonel Rajeev Kapoor, Senior Fellow, CLAWS. He can be contacted at seniorfellow7@gmail.com

PROGRAMME

INAUGURAL SESSION	
09:30–09:35hr	**Clip on Indian Battles in Mountains**
09:35–09:40hr	**Opening Remarks** by Lieutenant General (Dr.) VK Ahluwalia (Retd), Director, CLAWS
09:40–10:00hr	**Inaugural Address** by General VP Malik (Retd), Former COAS
10:00–10:15hr	**Theme Address** by Lieutenant General Mohinder Puri (Retd), Former DCOAS (IS&T)
10:15–10:30hr	**Keynote Address** by COAS and Patron CLAWS
10:30–11:00hr	Tea Break

SESSION I: CHANGING ATTRIBUTES OF WARFARE: FUTURE CONTOURS AND TRENDS	
11:00–11:05hr	**Chairperson: Opening Remarks** by Lieutenant General AK Singh (Retd), Distinguished Fellow, CLAWS
11:05–11:20hr	**Prospective Security Environment and Changing Character of Warfare** by Lieutenant General AK Singh (Retd), Distinguished Fellow, CLAWS
11:20–11:35hr	**Air Power in Mountains: Future Challenges and Responses** by Air Marshal Anil Chopra (Retd), Distinguished Fellow, CAPS
11:35–11:50hr	**C4I2SR: Measures to Strengthen the C4I2SR Architecture in Mountains** by Brigadier R Balan, MCTE, Mhow
11:50–12:20hr	**Q & A**
SESSION II: RESHAPING OPERATIONAL ART IN MOUNTAIN WARFARE: CHALLENGES FOR INDIAN ARMY	
12:20–12:25hr	**Chairperson: Opening Remarks** by Lieutenant General Gurmit Singh (Retd), Distinguished Fellow, CLAWS
12:25–12:40hr	**Mountain Warfare in the Indian Subcontinent: A Paradigm Shift?** by Lieutenant General Rakesh Sharma (Retd), Distinguished Fellow, CLAWS
12:40–12:55hr	**Construing Future Challenges for Indian Army in Mountains and Measures to Mitigate Them and Concept of Mountain Strike Corps** by Lieutenant General RJ Noronha (Retd), Former COS Southern Command
12:55–13:10hr	**Optimisation of RR in Conventional Mountain Operations** by Lieutenant General Gurmit Singh (Retd), Distinguished Fellow, CLAWS
13:10–13:40hr	**Q & A**
13:40–14:40hr	**Lunch**

SESSION III: DECODING FUTURE MOUNTAIN OPERATIONS IN THE INDIAN CONTEXT	
14:40–14:45hr	**Chairperson: Opening Remarks** by Lieutenant General Vinod Vashisht (Retd), Former DG NCC
14:45–15:05hr	**Synergised Firepower and Air Land Considerations in Mountains and Prospective Concepts in SF Operations** by Lieutenant General Vinod Vashisht (Retd), Former DG NCC
15:05–15:25hr	**Confronting Infrastructural Challenges** by Lieutenant General Harpal Singh, DG BR
15:25–15:45hr	**Operational Logistics: Current Challenges and Way Ahead** by Lieutenant General Balbir Singh Sandhu (Retd), Former DG ST
15:45–16:20hr	**Q & A**
16:20–16:30hr	**Closing Remarks** by Lieutenant General (Dr.) VK Ahluwalia (Retd), Director, CLAWS
16:30hr	**Tea and Dispersal**


GOC, DELHI AREA
DG INF
V P MALIK
DIRECTOR, CLAWS