Helicopter Operations in Tactical Battle Area

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"The helicopter is probably the most versatile instrument ever invented by man. It approaches closer than any other to fulfilment of mankind's ancient dreams of the flying horse and the magic carpet".

-Igor Sikorsky

Abstract

The article explores the significance of helicopters in modern warfare, emphasising their adaptability and widespread use in various roles, including combat and civil aid missions, particularly in mountainous regions. It delves into the complexities of operating helicopters in such terrains, highlighting challenges like high altitudes, rugged landscapes, and adverse weather conditions. Despite these challenges, helicopters play a crucial role in shaping the battlefield and supporting ground forces. The article discusses employment considerations such as doctrinal clarity, resource availability, integrated operations, and the utilisation of advanced technologies like night vision goggles and unmanned aerial vehicles. It concludes with recommendations aimed at enhancing survivability, infrastructure, network integration, coordination with ground forces, and training programs to optimise helicopter operations in mountainous terrain, ensuring their effectiveness in future conflicts.

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Introduction

Helicopter due to their flexibility and versatility has the capability to be employed in multiple roles in varied terrains. Due to which, today, the helicopter is omnipresent across a large spectrum of combat missions as well as in aid to civil authority. Major global military conflicts from the Vietnam War in the 20th Century to the operations by United States (US) and North Atlantic Treaty Organisation forces in Iraq and Afghanistan have seen helicopters play a major role. They have become a major component of land, maritime and air operations. As they come of age, they now possess the offensive capability to be deployed across the spectrum of conflict to achieve military objectives. Helicopters are potent weapons that have the capability to shape the battlefield. They provide military commanders with the flexibility and the concentration of firepower to win wars. With the induction of modern platforms into the Indian arsenal, a need arises to review the present employment philosophy of helicopters in the Tactical Battle Area (TBA) in the hills.

The age-old belief of the infallibility of the Himalayan ranges diminishes with technological advances in sensors enabling surveillance over these ranges. Coupled with current politico-military developments and the multiple flashpoints on a 2100-mile-long disputed border is the beginning of an assured two-front war, with varying permutations and combinations.[1]

Challenges for Present Helicopter Operations in Hills

The rugged mountainous nature of India's borders presents the Indian Air Force (IAF) with the mandate of sustained operations at high altitudes. High altitude presents a unique set of challenges and opportunities; it demands specialised training, equipment and strategies to ensure the success of military missions.

The rarefied atmosphere that comes with high altitude greatly reduces thrust, which in turn reduces payload capacity, which translates into fewer weapons and troop-carrying capacity. With a marked reduction in power margins, sluggish control response and an unpressurised cockpit, the efficiency of the crew is greatly reduced. The reduction in air density leads to lower thrust availability and increases the chances of engine surge leading to engine failure. Post-Kargil conflict, the primary debate on the

application of airpower has focused on the adverse implications of altitude and terrain on the effectiveness of airpower. Due to altitude limitations, the IAF could not employ MI-35 attack helicopters and had to press armed helicopters into the fight.[2] At the same time, lower density also leads to reduced responsiveness and controllability in aircraft. As a result, aircraft subscribe to larger radii of turn in the horizontal as well as vertical plane while manoeuvring endangering operational safety due to terrain proximity in narrow valleys. The air-to-ground weapon characteristic is also adversely affected by an increase in employment altitude resulting in unexpected errors.

Flying in the shadow of ridges leads to drastic changes in the ambient light, a phenomenon more pronounced while carrying out Night Vision Goggles (NVG) operations. This may lead to disorientation. Operations in snow-covered ridges may lead to obscure visions due to extreme glare. Flying in mountains is further complicated by weather phenomena. On mountains, especially in the Eastern Himalayan ranges, there is rapid and unpredictable deterioration in weather conditions. Additionally, early mornings are often characterised by the presence of radiation fog. These factors make it difficult to navigate in narrow valleys and acquire targets visually. In the plains, improving infrastructure allows faster mobility and logistics support. However, in mountainous terrain, helicopters have been the mainstay of air mobility through inter-valley troop transfer and logistics operations. Heli-lifting is the swiftest and safest option for heavy weapons and sensitive equipment in areas not connected to wide roads in the hilly terrain.

The inability to fly high and fast forces the helicopters to fly through valleys, leading to predictable routings. Airborne platforms are vulnerable to enemy Air Defence (AD) while operating in hills. In the context of the IAF, both the prospective adversaries boast of a robust and effective AD setup. In mountains, AD sensors and weapons are likely to suffer from the limitations of a limited line of sight, weather and terrain impediments to mobility and sitting. However, once they engage the target, there is no reduction in lethality. In fact, for infrared homing missiles, the cold ambient temperature and rare atmosphere are likely to improve sensor and aerodynamic performance. The potency of shoulder-fired surface-to-air missiles and anti-aircraft guns in mountains can be gauged by the estimated loss of ‘More than one hundred ground-

attack aircraft and three hundred helicopters' suffered by the erstwhile Soviet Military in its 10 years long campaign in Afghanistan.[3] In Op Safed Sagar, the IAF lost two aircraft to enemy surface-to-air weapons.

Owing to reduced power margins, helicopter operators are faced with the challenging task of compromising between fuel and payload based on the mission requirements. Reduced endurance and range entail frequent refuelling or resupply for sortie generation. The operating areas in mountainous areas are often unique and challenging owing to their location, elevation, gradient, length, surface, and weather conditions. Some of them are unpaved, unlighted, uneven, or surrounded by obstacles mostly suitable for visual flight rules operations, limiting their operational employability. The harsh environmental conditions at high altitudes increase the wear and tear on the aircraft, requiring more frequent maintenance and support. The terrain poses serious challenges to effective and reliable communications owing to line-of-sight restrictions. The whole working of command, control, communications, and intelligence setup is severely compromised entailing delayed information and decision-making.

Employment Considerations

Despite multi-faceted challenges, the helicopter is obliged to face phases of adaptation. However, the uncertainty pertaining to strategic context does not diminish its utility, as confirmed by its large-scale utilisation and challenges thereof. Hence, it is imperative to ensure realistic employment methods, and fleet management in a way that allows these adaptations and responds to new emerging requirements from recent operations:

- **Doctrinal Clarity**. Clarity on evolving concepts must be provided to tactical commanders at field units for streamlining the operations and the consequent training of crew. This should be based on the study and analysis of data pertaining to terrain, type of helicopters, weather, AD threats and performance considerations in high altitudes of one's own forces and those of the adversary.
    - Utilisation of helicopter platforms to undertake deep attack missions beyond the forward edge of the battle area or prefer air-ground integrated missions within TBA in close support of own troops as concept of operations.

- The operational relevance of airborne fighter air controllers, anti-Unmanned Aerial Vehicle (UAV)/drone missions in the modern battlefields must be deliberated and clarity on its envisaged conduct must be provided.

- Feasibility of the conduct of air assault to seize vulnerable areas/vulnerable points, and flank manoeuvre against armoured divisions considering the limitations of frontage in the mountains and the limited availability of mechanised equipment at those altitudes. The assessment must include the high-altitude weapon effectiveness and the type of weapon being carried by the helicopter.

- Predictable routing of helicopters in hills poses inherent dangers on combat search and rescue, tactical insertion/extrication missions from Man-Portable Air-Defence Systems even when operating with adequate control of air. Clarity on the conduct of such missions inside enemy territory must be laid down.

- **Availability of resources**. The requirement of helipads, fuel, weapon storage areas, communication nodes etc., in proximity to TBA must be factored in for doctrinal derivatives. The mountainous terrain provides a substantial certainty on the nature of the battlefield and the longevity of doctrinal concepts. Doctrinal clarity is the foundation of a well-laid-out strategy and seamless integration of plans from preparation to end objective between commanders, planners and executors.

- **Integrated Operations**. Seamless integration is imperative in future conflicts and necessitates understanding other's limitations more than their strengths. Differences in operating procedures and communication channels are a perennial source of ambiguity in airspace management in the hills. From an air war perspective, certain suggested measures are as under:

  - Synergistic usage of intelligence, surveillance, and reconnaissance assets and interoperability between sensors and communication network.

- Adaptation to common standard operating procedures in the operating area, ratified by the operating authority of all users. Optimisation between resources, limitations and target wise 'Required' effort rather than 'Desired'.

- A realistic evaluation of capabilities based on participating forces. Upon completion of the planning process, the plan must undergo real-time validation during joint exercises.

- Regular interaction at all levels during the planning phase and more importantly between on-field operators entailed better coordination and utilisation of available resources for successful outcomes. A week-long integrated planning between the participating forces prior to the commencement of the exercise would enable better coordination and planning.

- AD in TBA in a dense AD environment is a necessary evil and poses a credible contribution to the outcome of any conflict. Hence, integration of AD assets in TBA must be ensured at all costs.

- **NVG Operations**. NVG offers a paradigm shift towards operational employment despite the limitations of hills. This domain needs to be critically analysed with the objectives and targets in the area of responsibility versus the threats/ limitations. The operational window for night missions must be exploited with compatible platforms. Though a very stealthy option to operate in hills, it poses challenges of non-availability of weather and the inability of helicopters to climb and operate above the ridge line.

- **Unmanned Aerial Vehicle/Remotely Piloted Vehicles (RPAs)/Drones**. With increasing endurance, payload (capacity and types) and altitude op operations, UAVs are the most potent sensors for reconnaissance, intelligence and information sharing. However, the operational exploitation at the field level is limited and the same transcends into the operational planning. While the impetus for the operation of UAVs has gained momentum, the problem lies in integration and information sharing with the rotary wing platform. Based

on the US Marine Doctrine for effective Close Air Support for increasing the responsiveness and effectiveness of a close aerial reconnaissance system, some recommended measures are as under:

- Increased availability of aerial assets at the lowest possible tactical level.
- Place the aerial asset in connection with the forward operating base or a location near the operational area but within the radio communication range of the reconnaissance unit.
- Delegate the decision-making to the on-field commander and if needed in direct coordination with the reconnaissance unit as far as practicable.
- Enable flexible re-tasking of the UAVs in response to Point of Interest (POI) updates and higher priority emerging POIs.
- Delegate payload control authority to the local commander but leave the advanced UAV control to a UAV commander.

This will not only enhance battle field transparency and effective airspace utilisation but also reduce the sensor-to-shooter time and mitigate threats in the TBA.

- **Heli-vs-Heli Capability**. Limited effectiveness owing to reduced performance at high altitude and payload. Fully armed aircraft will have a very low radius of action limiting the combat capability. A potential threat to combat in hills is reduced endurance and reduced payload with sluggishness of controls resulting in reduced manoeuvrability. This along with reduced speeds limits the weapon launch capability. Most of the armed helicopters are equipped with area weapons whereas the requirement is precision weapons.

- **Airborne Command Post**. A strategic link, it provides information and tactical superiority accelerating the pace of operation and real-time decision-making to the military commanders. The US Army has developed a system of Army Airborne Command and Control System (A2C2S) mounted

inside a UH-60 Black Hawk. The centre features an integrated command and control system hosting an extensive communication suite and five fully automated workstations linked to a central computer that can operate a variety of battlefield software. A2C2S will provide military commanders with a highly mobile decision-making centre that can filter and relay real-time data while on the move. However, the inherent challenges of reduced communication ranges, endurance, on-board countermeasures and increased susceptibility to a ground threat. Despite these disadvantages, airborne command posts can still be deployed in mountainous regions with proper planning, training and adaptation to terrain challenges.

- **Anti-drone operation**. For a helicopter to be effectively utilised in anti-drone operation, it is necessary to equip the aircraft with sensors to detect and track drones in the area. Reduced radar cover available in hills necessitates the availability of on-board sensors. The operating envelope of UAVs, over the years, has increased as compared to helicopters, therefore a UAV operating at 20000 to 25000 ft is beyond the ceiling of most of the attack helicopters. Since UAVs in the Indian context will be picked up by the radar, guidance towards the target by a controller at many times will have to be on mental dead reckoning with restricted/no communications in the hills; the effectiveness of such operations needs to be validated.

- **Cost versus Benefits**. The future battles of India will be predominantly fought in the Himalayas and the helicopter platform will play a considerably significant role in the outcome of this war. With this inescapable reality, the planners and executors have an arduous task of contemplating objectives vis-a-vis risks. Unarguably, the machines are costly and pose a serious challenge to capacity building with their losses, but it is imperative to assess the risks and mitigate them as far as practicable. However, if the objective outweighs the risks, the planners and executors alike should be absolutely clear in their minds to the extent of risks acceptable. Presently, helicopter tasking does not permit realistic training for the threats posed by envisaged conflicts. The focus is mainly on

flying below the crest line, low altitude terrain flight for masking and routine tasks. The planners in coordination with the ground forces must study the expected approach axis for enemy thrusts, probable friction points and altitude bands. The altitude will decide the performance of the enemy's assets, the weight of an attack and the response to safeguard objectives. The nonlinearity of performance reduction with increased altitude has a direct bearing on all up weight, airspeed and manoeuvrability of helicopters and should therefore be factored in calculating the required versus desired employment. A Medium-Lift Helicopter faces significant limitations in payload capability beyond 3 km. So necessary trade-off between safety equipment (armoured plates, heat shields, Missile Approach Warning System (MAWS), Radar Warning Receiver (RWR) and payload capability in realistic terms must be discussed at least during peacetime exercises and should not be considered as a taboo/unsafe operation. It is pertinent to share this data with the ground troops in whose support these missions would be flown. This consideration would be significant as has been observed from the Kargil conflict wherein, a very potent platform could not be utilised owing to payload limitations.

Recommendations

"Owing to the development of aviation war has altered in character. Hitherto primarily an affair of 'Fronts', it will henceforth be primarily an affair of 'Areas'".

- Brigadier General PRC Groves, Royal Air Force, 1922

The Government of India's initiative of *Atmanirbhar Bharat* (Self-Reliant India) has put a strong impetus on indigenous production of military equipment. Enhanced and dedicated focus on indigenous equipment to reduce dependability on imports as well as building up its own capability of generating and enhancing platform and weapon inventory will go a long way in sustaining operations in hostilities. Some recommended measures are as under:

- **Aircraft Survivability**. Platform survivability can be ensured by either avoiding enemy AD or defeating them by means of passive or active measures. To avoid this, one

must be able to detect the presence of AD weapons in the area of operation. While it is possible to detect radar emissions using an onboard RWR or through dedicated electronic intelligence missions, it is practically impossible to detect a shoulder-fired missile before it is launched, and then too if one has been able to see the plume. An AD system with associated radar may be targeted by an anti-radiation missile-equipped aircraft of the composite package. An integrated aircraft survivability system including MAWS coupled with automatic dispensation of countermeasures will reduce the pilot's workload of constantly scanning for missiles. However, for any other type of air-to-ground weapon to be employed, all the problems discussed in the preceding paragraphs remain unsolved.

- **Aviation Support Infrastructure at Forward Military Bases**. To ensure rapid re-arming and refuelling of helicopters and quick turn-around of platforms, the aviation support infrastructure at forward bases needs to be upgraded to cater for future requirements including servicing facilities and weapon storage areas capable of housing all types of weapons envisaged.

- **Network Integration**. The future of network-centric warfare is here, and in today's battle scenario no aircraft can accomplish a mission on its own, it has to continuously communicate with other systems like RPAs, Airborne Warning and Control Systems and fighters for better synergy and optimum utilisation of effort. The *Akashteer* network in place allows the Integrated Air Command and Control System nodes to effectively see the picture of the army sensors, but the inability of controllers to provide any assistance to the low-flying aircraft hampers the situational awareness of the pilot, who is solely dependent on his timelines and the availability and assistance from a Forward Air Controller. Real-time information sharing through datalink/satellites would reduce sensor-to-shooter timings.

- **Coordination with Ground Forces**. The highest level of coordination is required with ground forces while operating in Counter Surface Force Operation roles in TBA to cater for de-confliction and negate fratricide. Towards this, there is a

need to participate in the joint exercises carried out for offensive roles as well in which near real-time Battlefield Air Strike missions, while the simulated ground war is progressing.

- **Training**. War in the hills is a specialised job and needs to be handled by a well-trained crew for maximum effectiveness. Crew involved in hill operations need to be adequately trained so that they are capable of undertaking offensive tasks along with the peacetime role of air logistics. Towards this, the firing ranges in the Toshe Maidan and the Kalith Field Firing Range in the northern sector and the Sikkim-B range in the Sikkim area of responsibility need to be made active and usable so as to have an effective practice of armament delivery. The feasibility of undertaking high-altitude armament on NVG must be explored as part of crew training.

- **Secure Communication Between Platforms and Joint Operations Centre**. To ensure the confidentiality of communication in the TBA between helicopters and ground forces, the communication needs to be secured. With the introduction of modern platforms like Apache, Light Combat Helicopter and Advanced Light Helicopter Mk-IV, secure communication between helicopters can be achieved but the same between airborne assets and ground forces needs to be focussed upon.

Conclusion

Helicopters, at one time, were considered the future of land warfare post a rather humble beginning. The battlefield commanders equated it to a decisive weapon replacing the battle tank, operating deep behind enemy lines. The dynamic of TBA in hills and flexible roles constitutes a good argument for maintaining mixed fleets combining several types and generations of machines. This is considerably the most probable way that helicopters would be able to respond to numerous demands that are being and continue to be made in TBA in the hills.

While there is no doubt pertaining to the need for helicopters, what remains to be answered is the capacity and employment philosophy to meet those challenges. It is also pertinent to understand the specificities linked to military helicopter operations in hills. With the evolving challenges of warfighting in the hills,

there is a need to find a response to the most relevant lessons learned from the past, upgrade the existing platforms to extend their operational employment, optimise resources to enable enhanced usage and lastly seamless integration with the end users. This understanding would lead to the interoperability of resources and easier maintenance of these platforms.

A potentially autonomous weapon will pay enormous dividends to the users who not only ensure their integration into land manoeuvres but also take full advantage of real-time technological advances, in cooperation with UAVs or the conduct of joint operations.

Endnotes

[1] Nishant Rajeev, "Why We Should All Worry About the China-India Border Dispute", 31 May 2023, Accessed on 26 Aug 2023. https://www.usip.org/publications/2023/05/why-we-should-all-worry-about-china-india-border dispute.

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[3] Singh, Ashish, "Airpower in Mountains", Jun 2012, pp 11-12.