Air Power and War Endurance in the Indian Context

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"In the force, space, and time continuum, there would be a need for us to prepare for short and swift wars as well as be ready for a long-drawn standoff"

—Air Chief Marshal VR Chaudhari, COAS, IAF[1]

Abstract

The changing character of warfare and recent wars indicate a change in the trend related to the duration of wars. The conflicts are continuing for longer periods but with a wavering tempo of operations. The changing trend has reopened the debate about the aspect of readiness for a short and intense war or a long protracted one. The level of preparation required by the defence forces is determined by the combination of the expected duration of the war and the likely tempo/intensity of operations. Several key factors contribute to air war endurance and affect the duration, effectiveness, and efficiency of air campaigns. There is a need to review the factors associated with the use of air power vis-à-vis air war endurance. Air powers in prolonged

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conflicts must demonstrate resilience, adaptability, and effective resource management to endure the challenges associated with extended durations of war and contribute to achieving the desired strategic objectives over the long term. The Indian airpower, mainly IAF should be ready for short and intense war and be prepared for long-drawn standoff.

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Introduction

The two World Wars were long-drawn affairs and lasted for five to seven years. These wars required massive effort and resources to sustain them causing a drain on the resources of the directly or indirectly involved countries. These wars were followed by a recession, reducing war-waging capabilities and reducing the efficacy of war to achieve political objectives. Wars since World War II have been local and with a limited number of participants for limited political objectives. Often conventional wars in the last seven decades have been short and swift. The few prolonged conflicts that took place were undertaken or supported by major powers who had adequate resources. The trend seems to be changing now and some defence and strategic analysts feel that the days of short, swift, and limited wars are over. Further, the distinction between war and peace is getting blurred.

The defence forces are directly involved in preparing for the conduct of war and have to be ready for all these situations. The higher direction of war stipulates the expected duration and intensity of a likely war. The changing trend has reopened the debate about the aspect of readiness for a short and intense war or a long protracted one. The military wherewithal is costly, especially the air assets for air war. Hence, there is a need to

review the aspects associated with the use of air power vis-à-vis air war endurance.

War Duration and Endurance

Wars can last anywhere from a few days to several decades. Long-drawn wars are characterised by their prolonged duration, continued engagement of military forces, and significant human, economic, and societal costs. Some examples of these wars include World War I (1914-1918), World War II (1939-1945), Korean War (1950-1953), Vietnam War (1955-1975), Iran Iraq War (1980-1988), and Afghanistan War (2001-2021).

It is essential to note that conflicts are complex, and the durations represent the broad spans of active hostilities. Additionally, some conflicts may continue in different forms even after the cessation of major combat operations. Efforts to end a long-drawn war often involve a combination of military, diplomatic, and humanitarian approaches. These may include peace negotiations, international mediation, sanctions, humanitarian aid, and efforts to address the root causes of the conflict. Reaching a sustainable resolution often requires addressing the underlying grievances and building a framework for long-term peace and stability.

Duration. Wars can be prolonged or of short duration as a result of various factors such as the character of the conflict, the parties involved, the goals and objectives of the war, external interventions, and the overall strategy and tactics employed by the warring parties. Some of the factors that can prolong a war are as follows:

- **Aim and Objectives.** Selection and maintenance of aim actually define the duration of the war. A clearly defined achievable aim leads to a short and swift war but an intertwined aim or changing aim defined without taking relevant capabilities into account invariably leads to prolonged conflict.
- **Complexity of the Conflict.** Wars with intricate causes, multiple stakeholders, and deeply entrenched issues are more likely to drag

on. The two World Wars would be under this category.

- **Geography and Terrain.** Wars fought in challenging geographic or climatic conditions can prolong conflict due to logistical difficulties and the strategic advantage it may provide to certain parties. Afghanistan is an ideal example of this aspect.

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- **Military Balance and Stalemates.** When opposing forces are relatively evenly matched, it can result in a stalemate, making it difficult for either side to achieve a decisive victory. History is replete with such examples.
- **Guerrilla Warfare and Insurgency.** Wars involving guerrilla warfare or insurgencies can be drawn out due to the asymmetrical nature of the conflict and the difficulty in defeating a dispersed, unconventional enemy. This aspect is becoming a norm with anti-national forces and organisations being supported by the enemy.
- **External Support and Intervention.** When external powers support opposing factions, it can escalate the conflict and make resolution more challenging, potentially leading to a prolonged war. The Ukraine conflict is a classic example of this factor.
- **Economic and Resource Factors.** The availability of resources, economic strength, and the ability to sustain a war financially can influence the length of a conflict.
- **Political Will and Negotiation Efforts.** The willingness of parties involved to engage in meaningful negotiations and find a peaceful resolution can significantly impact the duration of the war. A lack of political will or unsuccessful negotiation attempts can prolong the conflict. Once again, the Ukraine war fits into this category.

- **Ideological or Religious Motivations.** Wars driven by deep-seated ideological or religious beliefs may persist longer due to the fervour and commitment of the involved parties. Historically and even during recent times wars are being driven by religious ideologies and sentiments.

War Endurance. War endurance refers to the ability of a nation, military, or individuals to withstand and persist through the challenges, hardships, and demands of war over an extended period. War endurance is a critical factor in determining the outcome of conflicts. Historically, nations and entities with higher levels of endurance have often prevailed in prolonged conflicts, demonstrating the importance of preparation, resilience, and adaptability in times of war. War endurance is influenced by a complex interplay of various factors including physical and psychological endurance, resource availability and logistical endurance. A successful balance and effective management of these factors are crucial for a nation or entity to endure a war and sustain its efforts over an extended period. Some of the military factors that have a direct bearing on the war endurance are as follows:

- **Military Strength and Capability.** A well-equipped and well-trained military with adequate manpower and technological advancements significantly contributes to war endurance.
- **Logistical Efficiency.** Efficient supply lines and logistics are critical for maintaining the military's operations, ensuring a continuous flow of resources and support to the front lines.
- **Resilience and Determination.** The mental resilience, determination, and psychological preparedness of both the military and civilian population to face the hardships and horrors of war are fundamental for endurance.
- **Adaptability and Flexibility.** The ability to adapt to changing circumstances and strategies during a prolonged conflict is essential for maintaining a sustainable effort.

- **Alliance and Support.** The presence of strong alliances and international support can provide a morale boost, military assistance, and economic aid, enhancing a nation's ability to endure a war.
- **Geographic Terrain.** The geographical landscape can influence war endurance, as difficult terrain can make military operations more challenging and impact resource accessibility.
- **Technological Advancements.** Utilising advanced technologies in warfare can improve military efficiency, intelligence gathering, and strategic planning, potentially enhancing war endurance.

Russia-Ukraine War: Aspects Related to War Endurance

Russia-Ukraine war is well into the second year, with no end in sight. It began as a special military operation intended to be ended quickly but has become a prolonged war. The war has brought into light numerous points related to the duration of wars and war endurance.[2] These are commented upon below:

- Possibly, the Russian intention was to carry out a swift military operation and make a regime change in Ukraine. It did not succeed due to the interplay of several dynamics. The intention may be for short and swift conflict, but one can't really control it.
- One of the officially stated Russian objectives was the "demilitarisation of Ukraine". Russians attacked Ukrainian military bases and selective defence industry, considerably reducing the Ukrainian combat potential. The war-waging enablers need to be protected.
- After the high intensity of the operations initially, the tempo of the war has been wavering.
- While the use or non-use of full military power, especially air power, by Russia, raised questions for military thinkers and analysts. The answer could be that the calibrated approach to preserve military assets is

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essential in long-duration wars which Russia has subsequently prepared for.

- Ukraine does not have the capability to endure such a long war. Outside support from the USA and other European states, is enabling it to sustain the conflict.
- Harsh sanctions have been imposed on Russia. The sanctions do not deter aggression but their effect has to be catered for in the planning.
- No contact warfare philosophy is being used by both sides. Long-range vectors and drones are being used by Ukraine for retaliatory strikes and by Russians for punitive reasons. Even in the Armenia and Azerbaijan conflict drones played a decisive role.[3]

Indian Context

It is well known that India has two hostile nuclear weapon-armed neighbours with whom it has protracted disputes. China's desire to dominate Asia and then be a global power obviously impacts India, as China sees India as an impediment to that desire. China would therefore like to fetter India's growth and keep it unbalanced through internal and external issues. Pakistan continues to use non-state actors to maintain a situation of unrest for India through asymmetric means. China has strategic interests in using Pakistan. It is axiomatic that if the strategic interests of the two countries are aligned, they will maintain a strong and enduring strategic partnership that includes cooperation in the military sphere. As far as air warfare is concerned, there are numerous means for China and Pakistan to collaborate and synergise capabilities.

Aspects Related to Long-Drawn Air War

Air war endurance, also known as sustainability in aerial warfare, refers to the ability of an air force or a nation's air power to sustain prolonged operations and maintain a high level of combat effectiveness over an extended period. Endurance in air warfare is crucial, as conflicts may require sustained air operations over weeks, months, or even years. Effective endurance ensures that air power can maintain its combat capability, apply consistent pressure on the adversary, and achieve strategic objectives over the duration of the conflict. Waging a long-drawn air war involves a combination of strategic planning, resource management, technological capabilities, and logistics.

Operational Tempo and Intensity. Tempo is the rate at which military power is applied in an efficient manner across part or the entire area of operations. The level of preparation required by the defence forces is determined by the combination of the expected duration of the war and the likely tempo/intensity of operations. The versatility and flexibility of air power assets permit their high-tempo application. The ability to sustain a high operational tempo air war would entail, conducting numerous sorties and missions consistently over an extended period without a significant decrease in effectiveness. Several key factors contribute to air war endurance and affect the duration, effectiveness, and efficiency of air campaigns. Balancing these factors and optimising strategies to enhance air war endurance is critical for the success of any sustained air campaign.

Capability and Capacity Development

Capability vis-à-vis Capacity. Warfighting capabilities and the capacity to sustain operations are both essential. In other words, it is a combination of quality and quantity. While the capabilities of the Indian air power (e.g., reach, high altitude operations, precision, standoff, all-weather operations, airlift capability, etc.) have developed well, it is the

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numerical strength of the air assets like fighter aircraft, combat enablers, AWACS, AAR, Drones, etc., needs to be increased.

Aircraft Type and Capability. The type of aircraft being used, their capabilities, payload capacity, and mission versatility significantly affect how effectively and efficiently air operations can be sustained. Therefore, quality and quantity have to be balanced. In the Indian context besides inducting the LCA to make up the numbers, an adequate amount of advanced fighter aircraft also need to be inducted.

Diverse Inventory. Indian military air assets have a very diverse inventory of platforms, systems, and weapons. Although, diverse inventory management is a logistic nightmare, but has the benefit of the availability of resources during part disruption of the supply chain or sanctions.

Logistics and Supply Chain Management. Efficient and reliable logistics networks and supply chains are crucial for providing fuel, ammunition, weapons, spare parts, other critical supplies, and resources to sustain aircraft operations. Well-maintained supply chains are crucial for operational readiness and the ability to sustain a protracted conflict. A three-pronged approach is required to ensure continued availability, i.e., use of domestic resources optimally, having alternate and multiple sources for procurement and building up storage capability.

Maintenance and Repair Capabilities. During long-duration wars, efficient maintenance operations are essential to ensure the continued availability of air assets for extended periods. A well-organised and effective maintenance and repair infrastructure is also necessary to quickly restore aircraft to operational status after damage or wear and tear. Overreliance on foreign OEMs is sub-optimal and a certain level of in-house capability is essential.

Fuel Availability and Consumption. The enemy's fuel supply chain is the first target in modern war because the machines of war cannot move without its replenishment. Efficient fuel management plays a crucial role in prolonged air operations. The consumption would depend upon the tempo of operations and should be calculated and planned accordingly. Storage capacity, dispersal of storage sites, and availability at operating bases are important factors for planning.

Protection of air war endurance enablers from enemy attack becomes an absolute necessity. These vital points would require all-round protection, including protection from ground attacks by enemy Special Forces or terrorists.

Training and Personnel Readiness. Intangible factors like morale, training and tactics are very important for military success and more so in long wars. Well-trained and skilled pilots, ground crews, and support personnel are critical for the effective execution of air operations. Skillful human resources can maximise the effectiveness of air operations, thus enhancing air war endurance. So far Indian air power has fared well in these aspects.

Protection of Air War Endurance Enablers. Between World Wars I and II strategic planners at Maxwell Air Force Base in Alabama, built on Billy Mitchell's ideas to devise a new and practical air power concept called "The Industrial Web Theory"[4]. This theory advocated using air power to attack deep inside the enemy's territory, the critical points related to the enemy's capacity to fight. Even in the recent Russia-Ukraine war, Russian air power targeted Ukrainian military targets to destroy its war-waging capacity. This aspect has pronounced relevance in long-drawn wars. Therefore, protection of air war endurance enablers from enemy attack becomes an absolute necessity. These vital points would require all-round protection, including protection from ground attacks by

enemy Special Forces or terrorists, attacks using sub-conventional aerial platforms, and aerial attacks by fighter aircraft and long-range vectors. Protective shelters (maybe underground) are essential and they should be able to withstand the destructive power of enemy weapons. Besides providing the appropriate AD umbrella of sensors and weapons, passive measures like dispersion, deception, camouflage, concealment, etc. are equally important.

Decision Making & Situational Awareness. In long-drawn wars, it is even more essential to make the right decisions. This decision-making is impacted by three factors which are, a high degree of situational awareness; a quick and robust network system for information sharing, and lastly decision support systems made more agile by AI. In today's wars, situational awareness is paramount to be ahead of the enemy's thinking. This requires multi-domain surveillance and reconnaissance capabilities. Manual data processing gets overwhelmed quickly because of the plethora of data-gathering sources. This makes use of AI-enabled systems for data processing imperative. Hardened survivable networks are essential for unhindered and quick dissemination of both raw and processed data. The IAF has progressed well in developing a networked environment.

Unmanned Platforms. There has been an exponential increase in the use of unmanned platforms and systems as has been demonstrated in recent wars in Nagorno-Karabakh, Ukraine and Gaza. This shift will only accelerate in the coming years as AI-driven capabilities of unmanned systems improve rapidly. Drones of various types are replacing conventional platforms with the ability to take on a range of missions across the complete spectrum of conflict. Investment in anti-drone systems is also the need of the hour.[5]

Employment Philosophy and Air Power Application

Clearly Defined Objectives. A clear and practical definition of objectives, at all levels i.e., political, military and air force levels are imperative. If

the objectives are clear it helps in the orchestration of the war and ensures there is no wasteful utilisation of air assets.

In long wars, strategic plans need to allow for adjustments and adaptability in response to changing circumstances or unexpected events during a prolonged air war.

Integrated Conceptualisation and Planning. Warfare has become multi-domain in nature. For the best utilisation of resources, all capabilities are required to be used in concert right from the tactical to strategic levels. Surface force and air strategies need to develop in an integrated manner. Joint operations are essential, especially between the army and air forces. Integration of operational plans is the most important aspect in a long war scenario. Limited air assets need full and optimal exploitation to further military operations for their final objective. The operational plans between the air and the surface forces have to be fully integrated. Both the pre-decided war plans and the dynamic in war planning need to be firmed up jointly. *The air war is essentially targeting and the* joint target list should be made together with a lot of thought and deliberation.

Strategic Planning, Adaptability and Flexibility. In long wars, strategic plans need to allow for adjustments and adaptability in response to changing circumstances or unexpected events during a prolonged air war. Thorough strategic planning, including intelligence gathering and analysis, is essential to identify targets, assess enemy capabilities, and plan effective air strikes. Accurate and up-to-date intelligence enables informed decision-making throughout the course of the air war. The ability to adapt to changing circumstances, tactics, and technologies is crucial during a long-drawn air war. Flexibility in strategy, tactics, and equipment usage allows for effective responses to evolving challenges. The strategy and tactics employed for the application of force need to be robust, aggressive and tailored to the prevailing situation. The two

premier institutions of the IAF i.e., Tactics and Combat Development Establishment (TACDE) and Aircraft and System Testing Establishment (ASTE) would have a crucial role, and solutions developed must find a way to all air power operators.

Grey Zone Operations/No War No Peace Situations. Operations which are not in the realm of war but can range from the normal jostling of statecraft to just short of a declared war can be called Grey Zone wars. These are increasingly resorted to by nations to circumvent the restrictions of international covenants and treaties. Both China and Pakistan resort to these operations regularly. The standard norm is to use air power offensively, however, there are many other ways in which it can be used in grey zone war for which some reorientation of mindset, planning and doctrine is required.

Air Power Application Strategy. Well-thought-out strategy would have to be employed for the application of air power. Relevant aspects would be as follows:

- Air war would have to entail effect-based operations. The resources available would have to be judiciously employed for maximum effect. The targeting would have to be selective to hit where it hurts the most.
- The principle of selective dominance would have to be applied rather than attempting to achieve air superiority.
- The risk-taking profile would have to be more conservative. Some assets like rotary and fixed-wing transport aircraft and drones are very vulnerable in hostile airspace.
- AWACS and AEW&C aircraft are essential in providing all-around situational awareness and for enabling integrated control over diverse air power resources.
- Unmanned platforms, drones, and swarms would have to be integrated into the overall air strategy.[6]

- Precision weapons and Stand-off capabilities are important for long wars to both strike surgically to avoid collateral damage, as well as to conserve own expensively trained manpower.
- Hand-held air defence systems can be a deterrent by imposing an uneconomical exchange ratio with respect of aerial assets especially in urban areas and hilly terrain.

However, it is important that while supporting self-reliance, the minimum level of deterrence capability needs to be maintained while retaining a balance between quantity and quality.

- The generation of a maximum number of sorties would be the most desirable aspect of air war. Various enablers for enhancing the sortie generation rate would include a high pilot-to-cockpit ratio, hot turnaround capability, automated equipment handling and availability of wherewithal for quick turnaround of aircraft.

Larger Vital Aspects

Indigenous Defence Industry. Self-reliance is an absolute necessity in long-drawn wars. Self-reliance in military equipment and defence production needs to be attained to include all facets that can be used in both offensive and defensive operations. The ability to ramp up defence production at the time of need should be addressed holistically with the availability of skilled manpower, machinery, raw materials, parts and sub-assemblies. The Indian Air Force has encouraged indigenisation by attempting to create a homegrown defence production capability. It has been operating indigenously built aircraft, and aircraft built in India under licence production, in order to give a boost to industries which are investing in the aerospace field. However, it is important that while supporting self-reliance, the minimum level of deterrence capability needs to be maintained while retaining a balance between quantity and quality.

Long wars necessitate effective management of available resources, budget, and personnel to sustain a prolonged air campaign without running into shortages or burnout.

Infrastructure. Adequate infrastructure is essential to increase the war endurance. The adequate number of operating bases within proximity to the operational areas, and their ability to handle aircraft, refuelling, and maintenance, have a direct bearing on the air war endurance. Helipads in adequate numbers are essential, especially in hilly terrain. IAF initiative along with the Ministry of Road Transport & Highways, Government of India, of making stretches of highways as alternative runways is a step in the right direction. All the airfields should be dual use i.e., for use by both civil and military aviation. The Chinese model of Military Civil Fusion in this regard is worth studying. Besides, infrastructure for the storage of arms, ammunition, weapons and supplies along with transportation infrastructure is important. Protective infrastructure is also essential.

Resource Management and Sustainability. Air power is resource-intensive. With improvements in air power capability, brought about by innovations in cutting-edge technology, the cost of maintaining effective air forces has increased exponentially. Long wars necessitate effective management of available resources, budget, and personnel to sustain a prolonged air campaign without running into shortages or burnout.

Economic Sanctions. Economic and trade sanctions are a tool of statecraft, being used extensively against unfriendly nations extensively by the big powers. However, history has shown that the sanctions by themselves do not deter an adversary though they add to his difficulty. The effect of the sanctions especially on the air war, needs to be factored into the long-term plans since many imported critical modern air systems are in the realm of a few technologically advanced nations.

Collective Security. Collaboration and sharing resources with allied nations or coalition partners can extend the endurance of air operations by pooling together expertise, assets, and capabilities. So far India has never joined any military alliance. The relevance of collective security is not limited to military alliance anymore as it has relevance in dealing with grey zone situations using diplomatic support, intelligence sharing, cyber, and information warfare, etc. In the present circumstances, it is worthwhile to increase interoperability with friendly nations by carrying out exercises and developing commonality of equipment, procedures and tactics. IAF's initiative of graduating onto participation in multi-service and multi-lateral exercises both abroad and in India is progress in the right direction. Defence diplomacy has a big role and is an effective tool for political signalling and strategic coercion. The escalation matrix can be developed by a combination of the number and extent of defence activities.

Future Investments

Suggested future investments for the Indian Aerospace power to enhance its endurance for long wars are as follows:

- **Future Technology.** Air Force is a technology-intensive service. Development of technology into capability takes long periods of time, sometimes stretching to decades.[7] Therefore, there is a need to invest in emerging technologies and start brainstorming about their utilisation in warfare. Some of the future technologies that would impact air war and war endurance include Quantum computing, Hypersonic weapon systems, Artificial Intelligence, Robotics, Nanotechnology, Unmanned platforms, Drones and swarm technology, and Network-centric environment/Internet of things/system of systems.
- **Loyal Wing Man Concept.** Both manned and unmanned platforms have advantages and disadvantages. Therefore, they have to be used in unison in an integrated manner to gain the best advantage. Research

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is going on in many countries on the "Loyal wingman" concept where an unmanned aircraft is the 'wingman' for a manned aircraft. In India, HAL is working on the Combat Air Team System (CATS) program akin to that concept.

- **Hypersonic Weapons.** Hypersonic weapons provide new opportunities for quick response and surgical long-range strike capabilities. This requires the development of new air defence strategies, as traditional air defence systems may be unable to detect or intercept these weapons. China is making rapid strides in this field. This would necessitate the development of new technologies by us, such as directed energy weapons or advanced sensors. Our fixed air assets on the ground would require enhanced protective infrastructure to shield them from such destructive and precise weapons.
- **New Domains of Warfare.** Domains like cyber, space, electronics and information have come into the sphere of warfare. China has set up the Strategic Support Force (SSF) as a separate service, with defensive and offensive capabilities in above mentioned four domains. We also required to reorient and reorganise to deal with these new domains.
- **Space-Based Capabilities.** Air power is increasingly referred to as aerospace power since the war has now expanded into the domain of Space. Space-based systems and applications are now used to enhance every aspect of aerial warfare. They provide capabilities such as navigation, targeting, communication, early warning of missile

launches and space-based surveillance. Not only in conventional war but even in grey zone war, the involvement of space-based equipment and systems is ever-increasing. The integration of these systems with air assets is expected to expand exponentially both for offensive and defensive operations. Suitable importance has been given to this aspect in the latest 2022 version of the IAF doctrine.[8]

Conclusion

Air power is a crucial component of war endurance, affecting the military, and psychological aspects of a conflict. Its ability to disrupt enemy operations can significantly influence the duration and outcome of a war. War endurance for an air force involves a combination of logistical support, personnel readiness, equipment maintenance, strategic planning, resilience, national support, international cooperation, economic strength, and diplomatic efforts to ensure sustained and effective military air operations over an extended period of time during a conflict. Air forces in prolonged conflicts must demonstrate resilience, adaptability, and effective resource management to endure the challenges associated with extended durations of war and contribute to achieving the desired strategic objectives over the long term. IAF should be ready for short and intense war and be prepared for long-drawn conflict.

Notes

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