

Air Superiority: Myth, Magic or Panacea

Air Power's Quest for Control of the Air

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General Giulio Douhet wrote in 1921 that, 'he who controls the air controls everything'. Almost a century later, the official doctrine of most major air power nations continue to propagate a similar theme. His contention that control of the air is vital for victory in war was widely accepted and remains so till today. Prominent air power theorists, writing across ages and across continents, agreed to the primacy given to winning and maintaining control of the air. Control of the air is assumed to be *primus inter pares* of all the air power roles. The airplane as a weapon of war has undergone massive transformation, however the doctrine for its employment has remained remarkably stable underlining the need for air superiority. While US-led air power could field overwhelmingly disproportionate forces against its opponent, smaller nations fighting regional battles outside of major coalitions find it difficult to obtain theater-wide air superiority. In addition, recent experiences in the Armenia–Azerbaijan conflict and the ongoing Russia–Ukraine War has given rise to disruptive technology that is cheaper and easier to obtain. The fight for control of the air is becoming more complex. Unmanned and autonomous systems are delivering effects at a fractional cost compared to manned aircraft. While the means and methods

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to wage war have undergone tremendous changes, the need for gaining and maintaining control of the air has remained consistent.

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‘All that a nation does to assure her own defence should have as its aim procuring for herself those means which, in case of war, are most effective for the **conquest of the command of the air.**’ (emphasis added)

— General Giulio Douhet

INTRODUCTION

Giulio Douhet stands out among air power theorists for his prophetic insights into how the advent of aeroplanes would change the face of modern warfare. An Italian infantryman, who never pinned on wings, Douhet was appalled at the carnage of the World War I trench warfare and sought a way to prevent such bloodshed. Despite not having much actual flying experience, Douhet formed an excellent theory of air power that is still being studied today. He predicted that the development of the aeroplane would make the ‘command of the air’ the first objective in any campaign and the ultimate enabler of victory in war. He declared, ‘To conquer command of the air means victory; to be beaten in the air means defeat and acceptance of whatever terms the enemy may be pleased to impose.’¹ For him, it was impossible to achieve victory without first achieving what he termed ‘command of the air’. Surprisingly, he made this claim barely a few years after World War I (WW I), when air power was, at best, an exciting promise and not yet a proven weapon of war.

In subsequent years, air power theorists writing through the ages and across continents seldom failed to cite Douhet.² As air power developed, so did the theories, concepts, strategies and doctrines related to it. However, Douhet’s hypothesis that control of the air is a prerequisite for victory in war was widely accepted and remain so till date. The command of the air, also recognised as air superiority, is usually the first operational requirement for commanders. The official doctrines of most major Air Forces consider control of the air as the *primus inter pares* amongst all the air power roles.

This article aims to critically evaluate the crucial contribution of ‘control of the air’, or lack thereof, in war and analyse whether the control of air should be considered the primary air power role. The article will also explore situational and contextual limits to this tenet. Some air forces, including the Indian Air Force (IAF), have started using the term ‘aerospace’ to indicate

that space is a natural extension of airspace. Control of Space, though very relevant in modern warfare, has been left out of this article merely to confine the scope for more precise examination. The article has been divided into five sections: the origin and development of the concept; lessons from the past; air superiority and its relation to surface forces; limits of air superiority; and implications on deployment strategies for air power as the nature of warfare itself undergoes a significant change.

ORIGIN AND DEVELOPMENT OF THE CONCEPT: CONTROL OF THE AIR

Early Thoughts

The earliest known suggestion that the control of the air was essential for victory in war was put forth in 1893 by J.D. Fullerton, an Army Major serving with the British Royal Engineers. His paper, 'Some Remarks on Aerial Warfare', was presented at Chicago's World Columbian Exposition. He came out with seven propositions concerning aeronautics and its impact on warfare. One of his propositions was that sea and land warfare would be possible only when a nation has command of the air. He prophesied that, in a future conflict, 'the chief work will be done in the air, and the arrival of the aerial fleet over the enemy's capital will probably conclude the campaign.'³ Remarkably, this paper was presented a decade before the Wright brothers could demonstrate their 'first flight' in 1903. Unfortunately, the paper did not receive the attention it deserved, and its conclusions were appreciated only by a small circle of aeronautical engineers.

H.G. Wells' book, *War in the Air* (1908), was a work of science fiction that speculated on the critical role air power would play in future wars, well before aeroplanes were actually being used in war.⁴ Largely disregarded by military strategists, the book did ignite some interest among the public. The impetus for greater scrutiny was provided by the high cost in blood and treasure being incurred in land warfare.

Search for a Cause

The concept began to assume practical significance during World War I. Professional airmen, mostly working under army leadership, started comprehending the utility of aerial platforms. The bloody war of attrition taking place in the trenches provided major incentive to seek a solution through the use of air power. In August 1914, the Germans bombed the Belgian town of Liege using a Zeppelin, leaving nine civilians dead. The French retaliated a

week later by bombing German Zeppelin hangars.⁵ These events led to search for a theory that could underwrite the application of air power.

Hugh Trenchard, who later became the Chief of Air Staff (CAS) of the Royal Air Force, was the most senior-ranking air power advocate at that time. His advocacy of air power came to be defined by several tenets, one being that air superiority was an essential prerequisite to military success.⁶ Similarly, the French, after unsuccessful unescorted bomber raids over the Ruhr region, realised that 'victory in the air must come before victory on the ground'.⁷ The early 20th century military theories were hugely influenced by the assumption that the 'will' and 'morale' of people would be the determining factor in war. This thought influenced the development of air power theories that recommended punishment strategy, leading to the advocacy of aerial bombing by attaining air superiority. In 1917, the United States (US) Secretary of War, Newton Baker, instituted Bolling Commission to recommend the shape of the US air force. The commission recommended that an ideal air force would be composed of 62.5 per cent bombers and 37.5 per cent fighters.⁸ US Air Service Colonel Edgar Gorrell's strategic bombing plan of 1918 reflected the cumulative wisdom of British, French and Italian airpower thinking at that time. It carried the concept of air superiority far beyond the battlefield. Gorrell made a passionate argument for strategic bombing against the German industry using a drill as his metaphor of choice. A drill can only bore so long as its shaft remains intact. Gorrell argued that an Army, like the drill, is defeated if the supporting national effort, its 'shank', is broken.⁹ In the similar timeframe, the Soviets established a large army air force called *Voennyoye-Vozdushnyye Sily* (VVS) in 1920. Though the VVS was subordinate to army commands, doctrinally, air superiority was their primary mission.¹⁰ Douhet's book, *Command of the Air*, was published in 1921 under the auspices of the Italian War Department and is credited by many as the foundational work on air power theory in general and the concept of the 'control of the air' in particular. From then onwards, the requirement for air superiority was further developed by various air power theorists in their respective nations.

Development of Air Power Theories Before and During World War II (WW II)

WW I saw restricted use of air power with sporadic results and somewhat limited impact. However, post war, there was little doubt about the role of air power in modern war and that it represented a dimension that no major nation could ignore. The theories and concepts, in terms of deployment of

air power began to take shape. Like superiority on land, airmen were trying to define superiority in the air. Different views emerged as people often understood air superiority, and the means to attain the same, differently. Some observers interpreted air superiority as possessing a larger air force, while others equated it with the ability to drive the enemy air force into the defensive.¹¹ In terms of force-application, air power theorists continued with the concept of punishment strategy developed during WW I, and argued for air superiority as a prerequisite. In Britain, Air Marshal John Slessor suggested in 1936 that a nation could gain and maintain air superiority only through a relentless bombing campaign against enemy cities and industries.¹² Slessor, agreeing with Douhet, maintained that possession of air superiority would enable its possessor to conduct operations against an enemy at will while denying the enemy the ability to interfere effectively. However, offering a nuanced perspective, he stated that air superiority was not a permanent state; it had to be won and re-won. In his words, 'Air superiority is not a definite condition to be achieved once and for all. Having achieved command of the air, the nation still had to devote a portion of the force constantly to the maintenance of the condition.'¹³

General Walther Wever of the Luftwaffe argued for a more broad-based approach to air power than most other German theorists in this period. Wever contended that gaining air superiority, whether local or general, represented a difficult goal. Air superiority would demand an unremitting commitment, consuming disproportionate resources. Like most interwar airpower theorists, he believed that the bomber would be the decisive weapon of aerial warfare. However, the Luftwaffe's doctrinal manual clarified that the enemy's air force was the primary target at the beginning of the war.¹⁴ The British War Office issued a document in 1938, 'The Employment of the Air Forces with the Army in the Field'. This document devoted a major section to air superiority. The document stated that air superiority 'is a state of moral and material superiority which enables its possessor to conduct air operations against an enemy and at the same time deprives the enemy of the capacity to interfere effectively by the use of his own air forces'.¹⁵

On the other hand, no one in the US military elucidated the definition of air superiority as clearly as manual writers in Britain. No clear definition of air supremacy or air control, or air superiority could be found in the Field Service Regulations of the American Army or the Air Corps' Field Manuals. Field Manual 100-5 talked about dividing pursuit aviation into interceptor and fighter segments and the indecisive nature of air fighting, but nowhere could the reader find a clear and succinct definition of air superiority.¹⁶ General

Elwood 'Pete' Quesada of the US Army Air Corps, reflected this ambiguity when he stated, 'The fighter business in those days was a bunch of guys going up and fighting another bunch of guys without a known objective.'¹⁷

On the opposite side of the world, Imperial Japan emerged as the prominent air power of the East. There was no major air power in the region to challenge Japan. This factor, coupled with the fact that Japanese air forces developed as fleet air arm, led to the development of air power theories that treated air power as an extended arm of the army/navy. The design of Japanese aeroplanes was as much a product of geography as it was of their strategy. The Japanese strategy relied on a large number of long-range land-based aircraft that could strike targets deep in the sea. For this purpose, Japan occupied dozens of small islands in 1941 and created functional airstrips. This doctrine could enable them to rapidly launch mass air attacks on a possible invasion force or advancing enemy naval fleet. The underlying notion was that the large number of ground-based aircraft could successfully counter the comparatively small numbers brought by enemy aircraft carriers. These mass attacks were similar to what was prescribed in the Japanese Army doctrine, as these pilots were treated more like expendables rather than highly trained specialists. The assumption was that strength would lie in numbers rather than ability.¹⁸ Japan entered WWII believing that it would only need to fight short, swift wars, something they could win on account of (presumed) better aircraft and better training. Japanese air power theories did not dwell on the concept of air superiority in any detail.

Air power theories were keeping pace with the changing nature of warfare. On land, trench warfare in the First World War was giving way to armour-oriented manoeuvre warfare in the Second. In the sea, battleships were ceding ground to aircraft carriers. Similarly, airpower theories were being tested, and thereafter accepted or discarded based on the wartime experience. In that sense, WW II proved to be the ideal testing ground for various theories and concepts. Those that passed the test of war survived, becoming, in many cases, the doctrinal foundations for the post-war air forces.

Doctrinal Adaptation

At a fundamental level, war remains a 'contest of will'; victory being generally defined as a state of play wherein the enemy is either compelled or coerced into implementing your will. This truism has existed for centuries. However, the nature and character of warfare, more specifically the methods employed in warfare have always been evolving as per the extant conditions of weapons, technology, polity and levels of tolerance for damage caused to civilians/non-

combatants. In his famous treatise *On War*, Carl Von Clausewitz stated that 'War is thus more than a mere chameleon, because it changes its nature to some extent in each concrete case.'¹⁹ Clausewitz asserted that while the nature of war remains more or less constant, its character was ever-changing.

Fundamental to the employment of military force are principles of war, doctrine, strategy and tactics. The principles of war are broad guidelines that are universal in nature and deal with the conduct of war at a national or a grand-strategic level. Doctrines represent the organisational view in terms of force utilisation, and are usually service-specific or domain-specific in case of joint forces. Doctrine also serves as the medium via which knowledge is formally passed from one generation to the other. These learnings are considered as institutional knowledge and wisdom that should aid and advise the present and future practitioners. As key repository of knowledge, doctrines remain relevant, and fit for the purpose only if they evolve with time, otherwise they become dogma. While doctrines offer overarching guidance, strategy and tactics have limits that are situational and contextual. Steered by higher direction of war, originating in national leadership, force application at the strategic, operational and tactical level is environment-specific.

It is in this regard, that early air power theorists and practitioners endeavoured to differentiate air power from sea power and land power. In their writings and speeches, they were trying to demonstrate that utilisation of air power offered better ways of prosecuting warfare than the vastly expensive and time-consuming efforts on land and sea. Prominent air power theorist, Giulio Douhet dismissed the army and navy as being outmoded by the advent of air power. His famous treatise *The Command of the Air*, was based on the central belief that henceforth the decisive field of action would be aerial. Similarly, Billy Mitchell was asserting through his writings that 'future wars will...be conducted by a special class, an air force'.²⁰ Like Mitchell in USA and Douhet in Italy, Hugh Trenchard in Great Britain was advocating the use of airplane/aircraft as the primary means of waging war because it promised swift victory by direct targeting of the enemy's industrial and/or population centers, bypassing the fielded forces. Unfortunately, 'swift victory' was never delivered, especially when faced with a capable and determined enemy. Much chastened, the subsequent generations of air power theorists had to adopt a somewhat benign approach to the promise of air power. The contemporary theory of air power and official doctrine of major air forces is grounded in the operational realities of modern warfare. However, the need to gain and maintain control of the air continue to find primacy amongst all other air power roles.

Control of the Air: Search for a Definition

'Control of the air' as an attribute is defined or described differently by world's air forces and their doctrines. However, the primacy or absolute necessity for establishing control of air as a prerequisite for success in virtually any operation has not been questioned. For example, the British (RAF) air and space power doctrine states, 'Control of the air is the *primus inter pares* of the four air power roles. It has doctrinal primacy because it enables freedom of manoeuvre in all Service environments: air, land and maritime. Control of the air provides commanders with the ability to retain the initiative while denying it to the enemy, and although military operations may be attempted without it, success may be fatally compromised beneath contested airspace.' But it does add an interesting caveat that, 'even in the absence of an opposing air force, control of the air may therefore not be total, and is likely to be contested.'²¹ The USAF doctrine states that 'Control of the air is normally one of the first priorities of the joint force. This is especially important whenever the enemy is capable of threatening friendly forces from the air or inhibiting a joint force commander's ability to conduct operations.'²² The doctrine of the IAF broadly subscribes to a similar theme. It states, 'Control of the air is a priority as it is vital for the execution of the overall military strategy. This permits own air and surface forces to operate more effectively in the battle-space and denies the same to the enemy.'²³ The IAF doctrine further describes various degrees of control of the air, 'The degree of control of air varies from Air Supremacy (nil enemy air interference), Air Superiority (minimal enemy air interference) to Favourable Air Situation (limited by time and space with expected higher degree of enemy air interference). The degree will vary based on the degree of air contestation prevailing over the battle-space.'²⁴ The IAF doctrine makes the application of combat power contingent on achieving some degree of control of the air, as it states, 'Once some degree of control of the air is achieved, the subsequent air and surface operations can be coordinated to ensure maximised application of combat power needed to attain military objectives.'²⁵ In a near-peer conflict, control of the air will be hotly contested, and the warring parties would likely start from a condition of air parity. The doctrine of USAF defines 'air parity' as an air situation in which no force has definite control of the air. This represents a condition in which operations, both friendly and adversarial, over land, sea or air may encounter significant interference by the opposing force.²⁶ In such a situation, it is neither necessary nor possible to obtain theatre-wide air superiority in one attempt. The air commander would then have to seek localised air superiority.

Local Air Superiority

In certain scenarios, local air superiority will be adequate. How 'local' is local will depend on the time taken to achieve the mission objective. The emphasis is on effectiveness for a given amount of *time* and *airspace*. For example, air superiority over a few hundred miles for a few hours would be enough if the objective is the safe passage of a naval fleet through a strait. Some examples of successful land/sea operations conducted under the protective umbrella of localised air superiority/favourable air situation would be: the successful evacuation of the British Expeditionary Force at Dunkirk, Guderian's crossing of the Meuse River in 1940 with three French divisions in fortified defensive positions on the opposite bank and Tangail airdrop by IAF in East Pakistan in 1971.

Whether localised or theatre-wide, control of the air enables a national or coalition military force to prosecute the fullest range of offensive operations while preventing effective enemy interference. This offers some obvious advantages, particularly what might be termed the three freedoms: the freedom of initiative, the freedom to operate and the freedom to manoeuvre.²⁷ We will now examine some case studies from the past to understand how these concepts were applied during the wars.

LESSONS FROM THE PAST

To be superior in the air, to have air superiority, means having sufficient control of the air to make attacks—manned or unmanned—on the enemy without serious opposition and, on the other hand, to be free from danger of serious enemy air incursions.²⁸

— Col John Warden

The Spanish Civil War (1936–39) was the first conflict since WW I in which the opposing parties fielded air forces of nearly comparable size and technical proficiency. In this war, the Chief of the Nationalist air forces, General Alfredo Kindelan, displayed some understanding of the need to control the air. Kindelan appreciated from the outset that his military objectives would be placed at risk without control of the air. Since he lacked the resources to attain and maintain total air superiority, he sought local air superiority for specific operations. From the outset, Nationalist strike aircraft targeted the airfields, fighter aircraft, fuel supplies and Republicans' air defences.²⁹ Whenever he suspected that his bombers would not get through un-contested, fighter escort was provided. The primacy given in resource

allocation towards winning control of the air paid rich dividends, enabling victory for the Nationalists.

Learning the Hard Way

The German volunteer airmen participated in the Spanish civil war siding with the Nationalist forces as part of the Kondor legion. Despite learning first-hand the benefits of air control, they failed to include this aspect in their own doctrines.³⁰ Germans did not consider air superiority a prerequisite for success and frequently diverted resources for other operations. They used air power as long-range artillery to support their advancing army.³¹ This ground-centric approach to using airpower was a feature in the German *Blitzkrieg* of 1939–40. Though the Luftwaffe was better trained and better equipped than its adversaries, it did not wage a proper campaign for the control of the air. As a result, overall success notwithstanding, the invasion of Poland cost the Luftwaffe 285 aircraft (18 per cent of the operational strength committed to the campaign). Norway and Denmark cost a further 242 aeroplanes, mostly transport. A full 21 per cent of the Luftwaffe's combat aircraft committed to the Battle of France were destroyed from enemy action, totalling 1,129 out of 5,349 aircraft.³² Invariably, Germans learnt their lessons after paying a high price. Operation *Sealion*, the planned invasion of England, was cancelled because the Luftwaffe failed to achieve air superiority over the English Channel.³³

Likewise, the Allies started the air war in WW II with the premise that strategic bombing against key industrial targets by unescorted bombers would provide air superiority as a by-product. After suffering considerable losses in the Combined Bomber Offensive (1943), they learned the bitter lesson that air superiority is not a by-product but rather a prerequisite for success in an air war.³⁴ The lesson thus learnt was appropriately applied to Operation *Overlord*, *the invasion of the continent*. Many examples make a case for control of the air or air superiority, but none are as convincing as the Normandy landings of 1944. From the outset, control of the air meant everything. Adequate resources were allotted to ensure this objective was achieved. As a result, less than a month before the invasion, United States Army Chief of Staff, General George Marshall could state with confidence, 'We are about to invade the continent and have staked our success on our *air superiority*, on Soviet numerical preponderance, and on the high quality of our ground combat units.' (emphasis added).³⁵ The invasion was one of the defining moments in military history. Due credit was given to the contribution made by air superiority when General Eisenhower told his son

two weeks after the landings that in the absence of air superiority, he would not have been there.³⁶

Misplaced Assumptions

In recent times, the apparent ease with which US-led alliances achieved victory in Kuwait, Kosovo, Libya, Iraq and Afghanistan had lulled some into believing that air superiority could be easily obtained. Such an assumption can prove fatal. It was the overwhelming technological and numerical asymmetry enjoyed by the US-led coalition that enabled it to obtain and maintain such a state of air superiority. Smaller Air Forces around the world, fighting alone, would find it difficult to gain complete control of the air. In a near-peer conflict of regional nature, the air planner would do well to win localised control of the air before committing air resources to other missions. Below are three examples in this regard.

The battle for the Falkland Islands in 1982 could have turned on its head if the integral air power of the British task force had been unable to at least provide favourable air situation (FAS). The Royal Navy lost six ships but could absorb the losses. However, the sinking of even one of its aircraft carriers or the troopship *Canberra* would have been catastrophic. Loss of FAS over the task force might have even led to the withdrawal of the task force. Not surprisingly, post-Falkland British maritime doctrine emphatically states, ‘The minimal requirement for a successful [maritime] operation is a *favourable air situation*. *Air superiority* will be a requirement for sea control, where a robust challenge from the air is possible. *Air supremacy* is a necessary precondition of command of the sea.’³⁷

One of the intriguing features of the ongoing Russia–Ukraine war has been the inability of the much larger, better-equipped and technologically advanced Russian Air Force to gain and maintain air superiority over the Ukrainian airspace. A well-researched report by Justin Bronk of RUSI tellingly states, ‘It is important to begin by acknowledging the most influential failure of the VKS fixed-wing forces over Ukraine: the failure to find, fix, and destroy the bulk of Ukraine’s GBAD assets. As 2022 came to a close, the UkrAF continued to operate a significant number of its 9M38M1 (SA11) “Buk,” S-300PS/PT (SA-10) “Grumble,” and S-300V1 (SA-12) “Gladiator” SAMs, and the Ukrainian Army continues to operate numerous 9K33 (SA-8) “Osa” SAMs. The effective employment of these systems by Ukrainian forces has denied Russia air superiority over Ukraine and continues to force the VKS to operate very cautiously near the front lines.’³⁸ The Russians were half-hearted in their quest for

control of air. Despite wielding disproportionate assets, Russians did not invest enough resources in obtaining control of the air. As a result, they continue to pay a heavy price for ignoring this vital tenet of air campaign planning.

The most apt example wherein absolute primacy was given to gaining control of the air would be *Operation Focus*. This was the code name given to the pre-emptive airstrikes by the Israel Air Force against Egyptian airfields at the start of the Six-Day War (1967). Israel launched nearly all its 200 operational jets, keeping only 12 as reserves. The mission was a great success. Nearly 450 enemy aircraft were destroyed, mostly on the ground. Israel gained and maintained almost complete control of the air for the rest of the war, enabling the ground units of the Israeli Defence Forces to operate effectively.³⁹ This is a great example to illustrate that there is no room for half-measures in the quest for control of the air. Domination on the ground is often predicated on domination in the air, which brings us to the next important aspect of this article—the relationship between air superiority and surface operations.

AIR SUPERIORITY AND ITS RELATION TO SURFACE FORCES

Field Marshal Rommel once commented, ‘Anyone who has to fight, even with the most modern weapons against an enemy in complete control of the air, fights like a savage, under the same handicaps and with the same chances of success.’⁴⁰ Saddam Hussein and Slobodan Milošević learnt it the hard way. There are no historical examples where surface operations progressed as planned in the face of constant and relentless air attacks. On the other hand, control of the air can often turn things around on the ground. This was aptly demonstrated during the Korean War (1950–53). By July 1950, the UN forces (primarily comprising the US, UK and South Korean military) had suffered major setbacks. The situation on the ground was grave. The North Korean force had pushed UN forces far south of the Korean peninsula. With great difficulty, the Allies succeeded in holding a defensive perimeter, just outside the port city of Pusan, one they feared might break any time. General Douglas MacArthur realised that it could only be held if his air arm could keep the North Koreans from massing enough men and supplies for a final effort. UN still controlled the air despite the reverses on the ground. In the critical early period from June to September 1950, air power was almost certainly the margin of survival.⁴¹ Control of the air allowed the US-led UN forces to reverse the tide and forced the North Koreans to retreat, as the

constant attacks from the air made the war too expensive for the Communists to continue.⁴²

The need for air superiority also extends to maritime operations. US Naval commanders did not widely accept this view until the Japanese attack on Pearl Harbour. The sinking of the British capital ships *Prince of Wales* and *Repulse* by Japanese land-based aircraft in 1941 made it clear to the British that ships required air cover to operate effectively. The armadas that conquered the central Pacific in World War II were based around aircraft carriers, not battleships, and this led modern navies to prioritise aircraft carriers over other vessels. The planned naval invasion of Britain never took place because the German air force failed to provide air superiority. In recent times, the documents, allegedly leaked by the US Air National Guardsman Jack Teixeira, state that as per US intelligence assessments, Chinese plans for a sea-borne invasion of Taiwan are contingent on rapidly achieving air superiority.⁴³

The weight of historical evidence overwhelmingly suggests that air superiority is crucial to success on surface (sea/land) and therefore, must be accepted as the first objective in any conflict. This aspect, is sometimes not well understood or fully appreciated by surface force commanders. The point of divergence becomes more acute when the situation on the surface is not going too well. They generally consider close air support (CAS) as the most appropriate use of air power. They would prefer to have the aircraft available to them as part of their integrated-fire-plan akin to long-range artillery or to tackle the enemy planes if they appear overhead. In their mind, going after airfields, air defence sites or communication facilities is futile, as is the quest for air superiority, while the outcome is being determined on the ground. The situation becomes more complex when an enemy's ground offensive is either progressing well or seems to be on the verge of doing so. The ground commander would expect the air force to apply all its air effort towards CAS, stopping air superiority and interdiction operations until the ground situation improves. The surface commander's concern may very well be valid, as the loss of certain terrain may prove decisive in the eventual outcome.

A doctrine-bound air force might become a prisoner of its own process in such a situation, continuing to devote resources to gaining and maintaining air superiority while the situation on ground turns dire. On the other hand, tying down limited air assets to the progress of surface battle while the fight for air superiority is inconclusive can also have dangerous consequences. Without prohibitive air opposition, the enemy can undertake previously impossible counter-air operations to gain air superiority. He may even carry

out air attacks on vulnerable targets, interdict supply lines and disrupt ground manoeuvres. Therefore, the role of the theatre commander or joint force commander becomes crucial in force allocation. Each situation is different with its attendant connotations of military, political, informational and strategic aspects. A theatre commander would have to weigh all parameters before deciding to commit, usually scarce, air assets to one campaign or the other. In such a decision-making process, the opinion of a professional airman, acting in the capacity of the joint force commander or as an air component commander is crucial.

LIMITS OF AIR SUPERIORITY

Air superiority is not a panacea. It is not a guarantee for success. There is no denying the importance of air superiority, however, mere presence of air superiority is not an assurance of victory. For ground forces, air superiority provides freedom of action, not freedom from action. NATO launched *Operation Allied Force* in March 1999 to compel Slobodan Milosevic to halt human rights abuse against ethnic Albanians in the Serbian province of Kosovo. This was essentially an airpower operation with limited contribution from the ground forces. By mid-May, the coalition had achieved air superiority over virtually all of Yugoslavia. However, ethnic cleansing and Serb atrocities continued well past that point.⁴⁴ Air superiority has situational and contextual limits. Therefore, these must be understood clearly.

Air superiority provides strategic advantages to friendly forces, however, its strategic impact is contextual. German air superiority in the early phases of WW II and Allied air superiority in the latter half could not dent the morale of the German or British people. Russian air superiority has not caused the Ukrainians to give up. American air superiority in Vietnam could not alter the eventual outcome. Overwhelming air superiority failed to provide victory for the Soviets and later Americans in Afghanistan. Likewise, the French realised the limits of air superiority in Algeria, and we learnt it in Sri Lanka (1987–90). During the deployment of the Indian Peace Keeping Force (IPKF), despite enjoying air superiority over Jaffna, we could not force the issue as per our liking.

Military operations in irregular warfare (IW) are often very complex, especially if the insurgency enjoys significant local support. Success in such operations is possible only through the whole-of-government approach. In addition, IW is predominantly a land-centric activity, especially when the adversary merges with the local population effortlessly. In IW, air power

is generally employed in a supporting role to surface forces. Air superiority provides lesser assurance of success in IW than in conventional warfare.

One example severely exposing the limits of air superiority in IW, is the case of the Israeli intervention in Gaza in 2012. The Israel Defence Forces launched Operation Protective Edge in July 2014. This operation revealed that air-delivered precision firepower, particularly in urban settings, had limited success. The airpower failed at the tactical level despite unchallenged bomb-runs during the conflict. Neither could airpower achieve the broader strategic aim of deterring Hamas from launching counterattacks. Ultimately, airpower could not deliver the results the IDF wanted.⁴⁵

THE CHANGING NATURE OF WARFARE: IMPACT ON DEPLOYMENT OF AIR POWER

The constantly changing character of war has never been more evident than it is today. The recently concluded war between Armenia and Azerbaijan and the ongoing war in Eurasian heartland between Russia and Ukraine has compelled the military strategists across the world to take note. Both sides are utilising new and emerging technologies, as well as, making innovative use of existing technologies to devastating effect. Technologies like Machine Learning, Robotics, Artificial Intelligence and autonomous weapon systems backed by big data analytics have expanded the battlespace multifold. The war is being fought not just at the land, sea and aerial frontiers. Warfare has been brought home to a vast majority of population as it is being contested in space, cyber-space and informational domains.

These two recent conflicts offer a good opportunity for air power theorists to test the hypothesis that assigns primacy to gaining and maintaining control of the air. The Armenia versus Azerbaijan war was a conflict between near peers, while the ongoing Russia–Ukraine war has pitted a major military power against a modest force. These conflicts should interest Indian defence planners as we could find ourselves in a similar situation against Pakistan (a near-peer) or against China (major military power). Before delving into the need, necessity and the methods to gain control of the air in such situations, it would be prudent to briefly discuss the significant changes in the nature of warfare. Three essential aspects are being highlighted.

First aspect is the massive expansion of the battlespace. The war and its attendant destructive effects are not limited to the border areas. Both sides are deploying long-range fires from autonomous, semi-autonomous and manned system to target military and non-military facilities. Almost all of

Ukraine and vast regions of Russia are within range and reach of weapons that are frequently deployed. There is no safe sanctuary. The battlefield has also expanded to include, space, cyberspace and informational domains.

The second aspect has been the incredible transparency that has been achieved due to modern technology. The fog of war has not lifted in its entirety. However, the ability to glean useful information from myriad sensors has reduced it to a great extent. From high-quality images from low earth orbit (LEO) satellites to theatre-wide availability of high-speed internet (courtesy Starlink), use of Space has been a force multiplier for both sides. Use of artificial intelligence backed by data analytics tools are providing real-time, high-quality intelligence on smartphones to foot soldiers using sensor fusion and information integration. Increased transparency and faster information flow has led to the third important change: shortening of kill chains. The sensor to shooter time has been considerably shortened as it is impossible to hide manpower or equipment. Night, foliage and bad weather were often used to mask movement of troops and equipment. However, modern ISR sensors can see through all these and provide targeting information to the shooters around the clock. Hypersonic weapons like Kinzhal ALBM make the task of interception extremely difficult and expensive. Such weapons coupled with drone swarms, that are proving adept at saturating air defence networks, are tilting the balance in favour of the attacker.

The employment of air power, under these changed dynamics, has witnessed considerable innovation from the warring sides. Specific to the subject under discussion, three aspects of these wars require closer examination: drones, denial and democratisation of air power.

Drones⁴⁶

Between Armenia and Azerbaijan, neither side made a concentrated effort to seize control of the air. Limited by resources, both sides were content with striking at enemy targets utilising ballistic missiles, long-range artillery and drones. Although Armenia also made good use of the domestically produced drone Krunk as well as Russian-made Orlan-10, it was the Azerbaijani drones that were the centre of attention in this war. Azerbaijan could take control of the skies by intelligent use of drones. Azerbaijani forces integrated their drone operations with fires from manned aircraft and land-based artillery. Occasionally, drones also used their own ordinance to destroy various high-value military targets. The lack of effective counter from Armenians allowed Azerbaijani drones to penetrate the entire swath of the Nagorno-Karabakh

region, targeting Armenian armour, supply lines and logistics. Turkish-manufactured Bayraktar TB2 came in for special mention. In this conflict, the TB2 performed well in ISR as well as targeting. TB2 can be configured to carry smart, micro-guided munitions that can take out targets on their own. In addition, the Azerbaijan military also used the high-definition recordings captured by TB2s to produce many propaganda videos, which were keenly watched around the world.⁴⁷ The manner in which these unmanned and autonomous aerial systems challenged the traditional notions of air superiority led to military planners paying greater attention towards them. A similar theme is being observed in Ukraine.

In the ongoing Russia–Ukraine war, both sides have been using drones to great effect. Hundreds of reconnaissance and attack drones are flying over Ukraine and Russia every day. Some experts are calling it the first full-scale drone war in history.⁴⁸ Although Russia has a fairly large and well-established military industrial complex, it reportedly lacks a powerful drone fleet. In the early phases of the war, Russia relied on domestically produced Orlan-10 and Eleron-3SV drones for reconnaissance operations, while the Zala Kyb and Zala Lancet were being used as a loitering munition system. Sensing a lack of impact, Russians started using Iranian-made Shahed-136 drones in large numbers. Also called the Geranium-2 by Russia, Shahed carries a 50 kg warhead, designed as a loiter munition, it attacks when instructed. Costing a fraction of a cruise missile, difficult to detect on radar, aided by loitering capability, Shahed has been the weapon of choice for Russians.⁴⁹ Similarly, Ukraine has also been using Turkish Bayraktar TB2 and, US-made Switchblades and Phoenix Ghost drones with devastating accuracy. Ukraine has also been using small, cheap, commercial models of drones such as Matrice 300 RTK and DJI Mavic 3, each costing less than US\$ 2000.⁵⁰ Drones are challenging the traditional notion of air superiority as their operations continue unabated despite attrition or technical/numerical edge enjoyed by the adversary. Drones have allowed Ukrainians and Russians to undertake air attacks that would be extremely risky for manned aircraft. While drones have a free run, the traditional air assets are being denied the freedom to operate.

Denial

The air denial concept was first demonstrated by Egyptian forces during the 1973 Arab–Israeli War. The density and placement of Egyptian surface-to-air missiles (SAM) in the Sinai desert was so effective, at least in the initial phases of the war, that the more modern and better-equipped Israeli Air Force

experienced unacceptable attrition, thereby failing to perform its traditional missions in support of ground forces. Eventually, a physical attack by Israeli ground forces suppressed the Egyptian SAM sites and provided a safe corridor to the air force.⁵¹ Similarly, the Ukraine military has demonstrated that a smart protagonist can deny a stronger opponent freedom of manoeuvre by utilising the strategy of air denial.

Ukraine has effectively employed defence in vertical depth. The diffused and loosely connected layers include spoofing and jamming through electromagnetic means, cyber disruptions, and short-range mobile air defence weapons, sophisticated air defence missiles covering low, medium and high altitudes. Aided by frequent movements, Op Sec, signal hygiene and camouflage and concealment, the Ukrainians have successfully denied low and medium altitudes to Russian air assets. Russian jets continue to operate, mostly unchallenged, at high altitudes over Russia/occupied territories. Their forays into Ukrainian airspace are infrequent and inadequate to have a lasting impact. Despite Russia's significant advantages in force size and capability, Russian air power has failed to establish air superiority in this war. Ukraine has enforced near parity in the air by instituting air denial. As a result, it has managed to deny freedom of movement to Russian manned aircraft over most of Ukraine, while simultaneously retaining the ability to deploy its own manned and unmanned assets in the air littoral.⁵²

Democratisation of Airpower

Irrespective of the changing nature of warfare, the primary mission of air forces remains the same: to gain and maintain control of the air. However, the achievement of this objective would become increasingly more challenging. While the cost of achieving air superiority is continually rising, the cost of challenging air control through denial has reduced substantially. Modern fighter jets, precision weapons, spares, and crew training are expensive propositions. Even some of the rich countries in Europe field a small air power component. However, a protagonist can acquire numerous unmanned and autonomous aerial systems at a fraction of the cost. A resource-constrained military can contest air superiority by utilising large fleets of these systems. The time, effort and resources required in neutralising these systems could easily frustrate a major military power. Drone swarms will be extremely difficult to defend against, often requiring expensive countermeasures involving guns, missiles, electronic warfare tools or directed-energy weapons. This will make defending more expensive and difficult, reducing the advantage larger military power enjoys.

Coupled with the above, the easy availability of Man-portable Air Defence Systems (MANPADS) and advanced SAMs, the availability of reliable and real-time intelligence via open-source intelligence (OSINT) made possible through commercial satellite constellations and data fusion on applications available on smartphones, will level the playing field for warring sides. Ukrainian troops are receiving excellent intelligence on their smartphones backed by dispersed OSINT volunteers.⁵³ Images available through satellites are good enough to locate large units. However, when this data is fused with geo-located videos, postings on social media, Google maps, Maxar downloads, security camera footage, flight tracking platforms combined with classified intel, the fused information is extremely useful and reliable. OSINT has often provided Command HQ level situational awareness to fielded troops at fractional costs. Ukrainian troops have been successfully using a commercially available software called Palantir to make targeting decisions.⁵⁴ They are so happy with the results that Ukrainians have decided to use the same for identifying war crimes.⁵⁵

Lessons for the Future

The recent conflicts demonstrated that with the proliferation of cheap and widely available drones of various costs, capabilities, shapes and sizes, the battle for air superiority would become more complex. As the war is progressing, the survivability of drones in a contested environment has been called into question. Effective jamming and other counter-drone measures are becoming increasingly effective. However, it would be wrong to assume the diminished utility of drones as a result. Instead, drones must be seen as a much cheaper attritable asset. Compared to a manned fighter/bomber, which costs hundreds of millions, plus a trained pilot, costing even more, drones offer a cost-effective option in a contested environment. The secondary advantage is that while a downed pilot is not easily replaceable, with replacements often coming with zero experience, a drone operator, on the other hand, gains experience even when the equipment is shot down.

India could learn valuable lessons from this war by re-orientating force structure planning. We could consider reducing dependence on costly and numerically limited modern fighters/bombers in favour of more unmanned and autonomous systems. A swarm of small/medium-sized drones would cost a fraction of a Rafale or a Su-30 and could be considered expendable. In some cases of targeting, say, dispersed terrorist camps in forested hills, we could prioritise denial and disruption over destruction by employing numerous low-weight explosives delivered via drones versus one or two heavy precision

weapons delivered via a manned aircraft. Similarly, the sophisticated A2AD (anti-access and air denial) architecture enacted by the Chinese Western Theatre Command would extract a heavy cost from manned IAF assets. A force package comprising manned, unmanned and autonomous assets, sequenced intelligently is likely to return better returns. Force structure planners would do well to keep a sharp eye on the developments in autonomous aerial systems aided by artificial intelligence (AI). Rapid advancements or major breakthrough in this area could render our fleet of expensive fighter jets as redundant and as ineffective as the *Maginot Line*.

CONCLUSION

We need to look at air superiority in less than absolute terms, especially when the objectives are limited. However, a long-drawn war fought for much broader objectives, like total capitulation of an enemy nation, cannot be won without first gaining control of the air. Air superiority allows the entire joint force the freedom to execute its plan without prohibitive interference from the enemy. If enemy air interference continues, the surface operations will get bogged down, and the land/naval forces will suffer significant attrition. Air superiority accomplishes two things. First, it permits offensive air operations against any enemy target at a reasonable cost, and second, it denies that same opportunity to the enemy. With the requisite degree of control of air, an air commander, with the flexibility and versatility inherent in air forces, can deliver combat power on the enemy when and where needed to attain military objectives at any level of war. However, the emergence of peer competitors and an anti-access environment poses difficult challenge in the fight for control of the air. A determined adversary will contest the control of the air and air superiority, which once gained, would have to be continually regained. In such a scenario, the joint forces may not possess adequate resources to win and maintain air superiority over the entire theatre. It would be wiser, then, to invest in local air superiority or FAS. This situation will provide sufficient dominance to exercise specific capabilities or conduct specific operations with acceptable risk. However, the emphasis is still on maintaining the requisite control of the air. The degree of such 'requisite' control is contextual and depends on military objectives, scheme of manoeuvre and available resources. The emergence of new disruptive technologies has the potential to dramatically alter the tools required to challenge or obtain control of the air. However, the need for controlling the air will endure. In sum, control of the air is the

primus inter pares of amongst all the air power roles. It has doctrinal primacy because it enables freedom of manoeuvre over air, land and sea.

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