



CENTRE for AEROSPACE & SECURITY STUDIES



# A Framework for Air Operational Art

**Air Marshal Farooq Habib (Retd)**

*Senior Director*

**Working Paper**



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*Working Paper*

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*Every art has its rules and maxims. One must study them...*

*In the profession of war, the rules of the art are never  
violated without drawing punishment from the enemy, who  
is delighted to find us at fault.*

- *Frederick the Great*





## Abstract

*Operational Art is defined as 'the application of creative imagination by commanders and staff—supported by their skill, knowledge, and experience—to design strategies, campaigns, major operations and organise and employ military forces.' It is often referred to as a 'bridge between strategy and tactics' with a function of making tactical actions serve strategic objectives. Though, an important subject, operational art, surprisingly, has not been a regular topic of discussion in airpower literature. Additionally, there is also a tendency to explain 'air operational art' using the lexicon of land warfare. This often creates more misunderstanding, given the specific attributes and features of airpower. Air operational art, thus, needs more exploration and study, within the context of airpower theory. This paper is directed to this end.*

**Keywords:** Air Operations, Airpower, Air Strategy.



## Introduction

There is no widely agreed upon definition of operational art, however, it is commonly described as 'the application of creative imagination by commanders and staff—supported by their skill, knowledge, and experience—to design strategies, campaigns, major operations and organise and employ military forces.'<sup>1</sup> Quite evidently, operational art, like any other art form, is a product of knowledge and the creativity of the practitioner. While the stated definition is equally applicable to all domains of warfare, historically, it has found more projection in land operations. Consequently, there is a large archive of available literature, theory and publications on the subject of operational art with regards to continental operations, as compared to air warfare. Much of the dearth of related material on 'air operational art' (the term commonly used to denote the operational art specific to air warfare) could be ascribed to the fact that airpower is relatively a new entrant to the domain of warfare as compared to the land and naval powers which have existed since millennia. It has only been over a century since aircraft began to appear on the skies over the battlefields – a relatively short time, indeed, for the development and accumulation of significant volume of related literature.<sup>2</sup> Another possible explanation for this scarcity is that, airpower, driven by technological advances, has progressed at a breath-taking pace while its theory has lagged behind, resulting in obvious gaps. In any case, the aviators are often viewed as men committed more to action rather than the field of study, therefore, their contribution to the related theory has been rather muted.<sup>3</sup>

Owing to limited original material on air aspects of operational art, there is sometimes an attempt to explain the concept using the same lexicon and models which are exclusively relevant to the domain of land warfare. This exercise, however, is counterproductive in addressing intricacies of the subject, and even tends to create misunderstanding. Like other military domains, airpower too, has certain unique characteristics and employment principles, which must be expressed and understood in the correct perspective. It is neither academically nor tactically feasible to view

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<sup>1</sup> Patrick Sweeney, *Operational Art Primer* (Newport: United States Naval War College, 2010), 2, [https://www.moore.army.mil/mssp/PDF/nwc\\_sweeney\\_op\\_art\\_primer\\_16jul2010.pdf](https://www.moore.army.mil/mssp/PDF/nwc_sweeney_op_art_primer_16jul2010.pdf).

<sup>2</sup> Andrew Vallance, *The Air Weapon, Doctrines of AirPower Strategy and Operational Art* (London: Palgrave Macmillan, 1996), 7.

<sup>3</sup> Vallance, *The Air Weapon, Doctrines of AirPower Strategy and Operational Art*.



airpower from the lens of continental power or naval power as much as it is unrealistic to analyse the latter two from the perspective of airpower.

Beginning with discussing the origin and the conceptual aspects of operational art, it briefly explains the eternal guidelines of airpower employment. Finally, the paper identifies the important elements of air operational art which are considered essential for an air commander to plan and conduct an air campaign.

## Operational Art - The Concept

Besides the definition mentioned in the introduction of this paper, operational art is also described as 'the methodology used to determine how best to apply military resources to accomplish strategic aims. It is mostly comprised of the human element, the commander's inner eye, the ability to see the desired aim and steer the military system in a direction that will achieve this aim.'<sup>4</sup>

The statement implies that operational art is a sense, a wisdom, an expertise and a craft which is necessary for efficient conduct of war. Being an art rather than science, it is not surprising to find few intangible human attributes like 'creative imagination', 'inner eye', and the 'ability to see' etc. in the definitions of operational art. These attributes are not innate but require nurturing in a potential commander. Professional knowledge, theory, experience and practice facilitate the development of these attributes. That is why militaries all over the world establish elaborate training programmes for their personnel. Moreover, as the term itself suggests, operational art is a skill which is required to conduct battles at the operational level. The term 'operational level' of war is a relatively new concept in the military literature, generally believed to be introduced in 1920 by General Alexander Andreyevich Svechin, of the Soviet Red Army.<sup>5</sup> In the earlier military literature, only two levels of war, the 'strategic' and the 'tactical', were mentioned in line with the Clausewitzian tradition.<sup>6</sup> The addition of a third level was necessitated by the unique developments which had

<sup>4</sup> Walter Piat, *What is Operational Art? A Monograph* (Fort Leavenworth: School of Advanced Military Studies United States Army Command and General Staff College, 1999), 33.

<sup>5</sup> Jacob Kipp, "Soviet Military Doctrine and the Origins of Operational Art, 1917-1936," in *Soviet Doctrine from Lenin to Gorbachev, 1915-1991*, ed. William Frank Jr. and Philip Gillette (Westport: Greenwood, 1992) quoted in Andrew Harvey, "The Levels of War as Levels of Analysis," *Military Review* (2021): 75-81, <https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/ND-21/Harvey-Levels-of-War-1.pdf>.

<sup>6</sup> Harvey, "The Levels of War as Levels of Analysis."



gradually started to influence warfare in the second half of 19<sup>th</sup> Century, including the advent of technology enabling increased mobility, large sized armies, expanded battlefields and even multiple theatres of war. The changing character of war necessitated that its planning and conduct be based upon 'chunks' and 'portions' of the whole campaign, which came to be known as operations.<sup>7</sup> Efficient execution of these campaigns and operations required the commanders to conduct meticulous planning, coordination and synchronisation of resources to achieve the assigned strategic objectives. Combined arms operations, which had become a usual feature of warfare since World War II, added yet another dimension of complexity to the commanders' assignment. The task was thus, described as an 'art' rather than a science, as it required specialised skills that went beyond the rigid military methodologies taught at war colleges.

While history has recorded the skilfull performance of this art since hundreds of years, the credit of coining the terminology of 'operational art' is ascribed to the same Soviet officer, Svechin, who introduced the concept of operational level of war.<sup>8</sup> Svechin defined it as the 'totality of maneuvers and battles in a given part of a theater of military action directed toward the achievement of the common goal, set as final in the given period of the campaign.'<sup>9</sup>

An intermediary, between strategy and tactics, operational art serves as the linkage between the two levels of war. Military strategy provides guidance and objectives, while tactics provide the knowledge and skill of fighting battles. Operational art connects the two by providing the conceptual framework for employment of available resources and defines 'the conditions for victory sought through battles.' Operational art, thus, functions as a 'conceptual bridge' between strategy and tactics and directs tactical actions to serve strategic ends.<sup>10</sup>

While the term, operational art, began to appear in Soviet military literature, in the interwar period, the concept found acceptability in the United States (US) much later,

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<sup>7</sup> James Schneider, *Introduction to The Nature of the Operations of Modern Armies* (Portland: Frank Cass, 1994) quoted in Wilson Blythe, "A History of Operational Art," *Military Review* (2018): 37-49, <https://www.armyupress.army.mil/Journals/Military-Review/English-Edition-Archives/November-December-2018/Blythe-Operational-Art/>.

<sup>8</sup> Blythe, "A History of Operational Art."

<sup>9</sup> Blythe, "A History of Operational Art," 40.

<sup>10</sup> Blythe, "A History of Operational Art."



i.e., in the mid-1980s, with the publication of the revised 'Air-Land Battle Doctrine.'<sup>11</sup> The U.S. Army was ahead of its sister services and the joint staff, to embrace the concept formally in its doctrine.

## **Operational Art in Aerial Warfare**

Like many other military concepts, operational art also started as a term related essentially to land warfare. Naturally, most scholarly discussion on operational art has been done in the context of land warfare, using terminologies which relate to the realm of land operations. Table I depicts a list of the elements of operational art, as proposed by two scholars and two US publications:<sup>12</sup>

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<sup>11</sup> Blythe, "A History of Operational Art."

<sup>12</sup> Piat, *What is Operational Art? A Monograph*, 12-20.



**Table 1: Elements of Operational Art**

James Schneider	Shimon Naveh	US Army Manual FM 100-7	Joint Publication 3-0
Friction	Dominance of the Aim	Centres of Gravity	Synergy
Logistics	Deep Structure and Hierarchical Logic of Action	Decisive Points	Simultaneity and Depth
Terrain	Simultaneous Attack	Line of Operation	Anticipation
Centre of Gravity	Centre of Gravity	Culminating Points	Balance
Decisive and Objective Points		Indirect Approach	Leverage
Central Position and Line of Operations		Positional Advantage & Strategic Concentration of Forces	Timing and Tempo
Theatres of Interests		Deception	<ul style="list-style-type: none"> <li>• Operational Reach and Approach</li> <li>• Forces &amp; Functions</li> <li>• Arranging Operations</li> <li>• GoG</li> <li>• Direct vs Indirect</li> <li>• Decisive Points</li> <li>• Culmination</li> <li>• Termination</li> </ul>

**Source:** Author's own.

In a bid to explore the elements of air operational art, one must start with the basic definitions (mentioned earlier) of the term. Knowledge of the related theory and experience stand out as important features in the definitions which are essentials to master the art. Of course, the experience of the commander as well as that of the organisation which is formally expressed in airpower doctrine and other related publications is vital to the conduct of operational art. In addition, knowledge of airpower theory and its historical context is also crucial for air commanders to effectively meet the challenge of employing airpower.<sup>13</sup> Thus, one has to be well

<sup>13</sup> Colin Gray, *Airpower for Strategic Effect* (Alabama: Air University Press, 2012), 291.



versed in airpower theory, its evolutions and development as well as the doctrinal truths and employment imperatives to effectively practice air operational art. It is a hands-on art, acquired and consolidated partly through the knowledge of theory and doctrine, and partly through one's own creativity and experience. The theory serves to educate the commander and the doctrine, as the 'distillation of experience' provides guidance for the best practices of airpower employment.<sup>14</sup> A discussion on airpower theory is beyond the scope of this paper, however, it is considered important to highlight the eternal guiding principles of airpower employment in order to establish a basic framework for air operational art.

## Guiding Principles of Airpower Employment

### Offensive Use of Airpower

Success in military operations, generally, depends upon the effectiveness of offensive actions. In that context, airpower, with its ability to surpass defensive barriers and deliver lethal firepower, is an excellent means of offence to achieve decisive results. The ubiquity of air enables airpower to be ubiquitous – thus, enabling an attacker to approach from any direction, while rendering the defender reactive. Colonel Phillip S. Meilinger, in his famous 'Ten Propositions Regarding Airpower' has highlighted that 'the adage, the best defence is a good offense, is almost always true in air war.'<sup>15</sup> Hence, even in defensive air campaigns, offensive action needs to be embedded in order to make them successful.<sup>16</sup> The opportunity provided for offensive action is not restricted to large air forces only. The very nature of airpower, combined with availability of air-launched long-ranged precision weapons present the potential of meaningful offensive action to medium sized and smaller air forces also, which needs to be capitalised effectively. Shaun Clarke, in his magnum opus 'Strategy, Air Strike and Small Nations', deliberates the prospects of successful strategic offensive strikes by smaller air forces. The offensive employment of airpower must, therefore, remain the fundamental principle for campaign planning.

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<sup>14</sup> Gray, *Airpower for Strategic Effect*.

<sup>15</sup> Phillip S. Meilinger, *Ten Propositions Regarding Airpower* (Alabama: USAF School of Advanced Airpower Studies, 1995), 19.

<sup>16</sup> Sanu Kainikara, "Principles of War and Airpower," (paper, Airpower Development Centre, Canberra, 2012), <https://airpower.airforce.gov.au/sites/default/files/2021-03/WP31-Principles-of-War-and-Air-Power.pdf>.



## Gaining Control of Air

*'Control of the air is the fundamental enabler of airpower's many contributions to strategic effect.'*<sup>17</sup>

In fact, no airpower role can be performed effectively without first having a certain degree of air control, making it the first priority of an air leader. The essentiality of air control for the employment of airpower can be gauged from the fact that it is included in Meilinger's 'Propositions'; 'Ten Attributes of Airpower' by Richard P. Hallion and '21 Dicta of Airpower Theory' by Colin S Gray.<sup>18</sup> Field Marshal Erwin Rommel, an astute land strategist, stressed the significance of this vital requirement for air control as follows, *'Anyone who has to fight even with the most modern weapons against an enemy in complete control of air, fights like a savage, against a modern European army.'*

## Centralised Control

Centralised control has been an eternal principle for efficient employment of airpower. Marshal Arthur William Tedder emphasised the requirement for centralised control of air in the following words *'Given centralized control of air forces, this flexibility brings with it an immense power of concentration which is unequalled in any other form of warfare.'*<sup>19</sup> Air assets are always limited especially in relation to the assigned task. If these are divided and distributed under various controlling authorities, the cumulative effort tends to become diluted, inefficient, and eventually wasted. Another related issue to the control of airpower is that its employment must remain the business of airmen. Due to airpower's ability to fetch prompt results, sometimes, there is a tendency of controlling it directly by the political leadership. The results have been disastrous. A case in point here is the USAF campaign 'Rolling Thunder' during the Vietnam War, in which the targets, and even some of the tactics were defined by the political leadership with almost no inputs from air commanders, resulting in its complete failure.

## Exploiting and Influencing Time

One of the most amazing characteristics of airpower is 'speed', due to which it gains the potential to significantly alter the notion of time. The point is lucidly stated by

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<sup>17</sup> Gray, *Airpower for Strategic Effect*, 283.

<sup>18</sup> Gray, *Airpower for Strategic Effect*, 272-274.

<sup>19</sup> Arthur William Tedder, *Airpower in War* (London: Hodder and Stoughton, 1947), 89.





Hallion, *'The time compression is inherent to airpower.'*<sup>20</sup> This ability allows airpower to generate mass and firepower at a given place, at a time of its choosing, and in turn, influence the famous 'Time-Space-Relative Strength (TSR)' matrix almost at will. It has huge potential and must be exploited to the hilt by an air commander.

### Capitalising on Tech

Rapid progress in airpower owes much of its existence to advancements in technology. The availability of technology in a country is a function of scientific development, available resources and geopolitical factors. An air leader must remain in sync with technological and the opportunities they create for employing airpower. Technology, however, must not be considered a substitute for strategy. Airpower is basically about 'generating the effects on behalf of policy',<sup>21</sup> while technology should be seen as an enabler of those effects.

## Elements of Air Operational Art

In the following section, a list of elements of air operational art is deliberated which are considered relevant to air operations. Some of these may not qualify to be labelled as elements in the classical sense but have been included here for their value and significance to the practice of air operational art.

### Political and Military Objectives

The famous Clausewitz dictum that 'war is an extension of policy by other means' defines war as a political activity. Wars are fought to achieve political (policy) objectives which are defined at the highest level of leadership in a country.<sup>22</sup> The objectives are translated into a military framework at the military-strategic level. An illustrative example of the relationship between political and military objectives can be found in another quote by Clausewitz, 'no one starts a war—or rather, no one in his senses ought to do so—without first being clear in his mind what he intends to achieve by that war and how he intends to conduct it.'<sup>23</sup> The first part of the underlined text

<sup>20</sup> Bc. Silvie Janičatová "Contemporary Role and Use of Air Power: Case Study of the United Kingdom," (Dipl. Thesis, Faculty of Social Studies, Department of Political Science, Masaryk University, 2018), 105, [https://is.muni.cz/th/qjvvr/DP\\_FINAL.pdf](https://is.muni.cz/th/qjvvr/DP_FINAL.pdf).

<sup>21</sup> Gray, *Airpower for Strategic Effect*, 272.

<sup>22</sup> Milan Vego, "Converting a Political- to a Military-Strategic Objective," *Joint Force Quarterly* 112 (2024): 100-112, <https://ndupress.ndu.edu/Media/News/News-Article-View/Article/3680005/converting-a-political-to-a-military-strategic-objective/>.

<sup>23</sup> Joel E. Hamby, "Striking the Balance," *Armed Forces & Society* 30, no. 3 (Spring 2004), 334.

symbolises the political objective while the second part represents the military objective. The military objectives are thus, always subordinate to political objectives, but as Liddle Hart cautioned, the policy must not demand from the military that which is impossible to achieve through the available means.<sup>24</sup> Once the objectives have been defined, every operation must be directed towards its attainment. It is thus, the reference point which must be clearly understood by the operational commander whose task is to achieve military conditions for the fulfilment of these objectives. In plain words, there are three fundamental questions<sup>25</sup> which any operational commander needs to answer in order to clearly outline the contours of his operational plan to accomplish the given objectives. These questions are:

- a) What military condition must be achieved in the theatre of war to achieve the strategic objectives?
- b) What sequence of actions is most likely to produce that condition?
- c) How should resources of the force be applied to accomplish that sequence?

The answer to these questions unravels the details of the methodology which enables the air commander to achieve military objectives optimally within available resources. Importantly, these answers also lead him to pursue a clearly defined and attainable end state. Airpower, by virtue of its characteristics is unique in the sense that it provides the fastest route to the achievement of these objectives.

### **Analysis of Operational Environment**

A war is fought based on objective analyses of the full spectrum of one's own and adversary's capabilities, and the existing environment. The process ideally begins before the actual operations and continues ceaselessly throughout the conflict.<sup>26</sup> The focus remains on getting the realistic 'correlation of forces', including inventory of weapons systems, their comparison, available infrastructure, logistics, and so on. The analyses must also include the capabilities related to the domains of space, cyberspace and electromagnetic spectrum to provide a comprehensive understanding of the operating environment of the conflict. A continuous process of reassessments is vital

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<sup>24</sup> Basil Henry Liddell Hart, *Strategy* (New York: Plume, Second Revised Edition, 1991), 352.

<sup>25</sup> *United States Army FM 100-5 Operations* (Washington, D.C.: Headquarters Department of the Army, 1993) in Walter Piat, *What is Operational Art? A Monograph* (Fort Leavenworth: School of Advanced Military Studies United States Army Command and General Staff College), 8.

<sup>26</sup> John P. Hunerwadel, "Planning to Win A Study in Strategy and Operational Art," *Air & Space Power Chronicles* 26, (2002), <https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Chronicles/hunerwadel.pdf>.



to incorporate necessary changes in the plan. So, analysis of capabilities and environment remains the basic step which defines the course subsequent actions.

### Identifying Centres of Gravity (CoG)

Centres of Gravity (CoG) can be described as 'the set of characteristics, capabilities, and sources of power from which a system derives its moral or physical strength, freedom of action, and will to act.'<sup>27</sup> CoG can also be understood as the elements of enemy system, both military and civil, which are most critical to wage and sustain war. Their destruction is the fastest way to induce the enemy commander to make necessary concessions which will contribute to the attainment of military and political objectives. CoG exist at all levels of war, and due to its unique characteristics, airpower has the ability to target these centres concurrently. At operational level, the destruction of CoG can force the enemy commander to abandon his campaign, while at the strategic level their destruction could compel the adversary leadership to give up the option of war.

Due to their significance, however, CoG are generally heavily defended entities, and thus, difficult to target. In this context, the concepts of 'critical capability' and 'critical requirement' and ultimately 'critical vulnerability' gain importance for the purpose of targeting these centres.<sup>28</sup> CoG derive their value from the critical capabilities which are the enablers for the former to function. Similarly, 'critical requirements' are essential conditions, resources, and means for a critical capability to be fully operational. As an example, consider a particular airfield identified as a CoG, due to its significance to enable enemy aircraft to conduct operations in a particular sector. A successful air attack, however, on this airfield may not be feasible due to strong defences. However, operations on the airfield would obviously be dependent upon various resources and facilities like fuel, ammunition, and communication infrastructure etc. for optimum functioning. While the airfield itself may be well-protected, one or more of these facilities could still be vulnerable to attack on their critical nodes extended even beyond the airfield, subsequently, affecting the

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<sup>27</sup> Joint Advanced Warfighting School (JAWS), *Operational Art and Campaigning Primer*, report (Norfolk: Joint Advanced Warfighting School, 2010), 245.  
[https://www.moore.army.mil/mssp/PDF/jaws\\_campaign\\_planning\\_primer\\_2010v-4.pdf](https://www.moore.army.mil/mssp/PDF/jaws_campaign_planning_primer_2010v-4.pdf).

<sup>28</sup> Joe Strange, *Centers of Gravity & Critical Vulnerabilities* (Quantico: Marine Corps University, 1996) in ed. John Hunerwadel, "Planning to Win A Study in Strategy and Operational Art," *Air & Space Power Chronicles* 26, (2002),  
<https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Chronicles/hunerwadel.pdf>.

operations. Hence, the analyses for critical vulnerabilities becomes significant along with the identification of CoG.

While a commander carries out analyses of adversary's CoG and critical vulnerabilities, his counterpart too, conducts the same exercise, sometimes, with even more vigour. So, it is crucial to examine and protect one's own CoG.<sup>29</sup> The task is equally important, as the victor is decided, to a large extent, by the fact that who utilises his strengths to defend his vulnerabilities and destroy those of the enemy.

### **Deployment**

An optimum deployment of air assets facilitates the set of conditions to undertake one's campaign optimally. It enables efficient concentration of force and enhances the liberty of action. It also ensures balance in the offensive and defensive posture during the entire campaign. However, unlike the surface forces, airpower possesses the capability to be employed from widely dispersed locations and yet be converged at a selected target to deliver the necessary combat power.<sup>30</sup> Airpower can also promptly respond to changing conditions by undertaking re-deployments and stage-through operations. Thus, the conventional notion of 'imbalance' due to spatial dispositioning of forces, which is critically relevant to land forces, does not essentially, apply to air forces. However, aircraft need airfields to operate, so keeping them functional throughout the period of operations becomes an overriding consideration for the air commander. Out of service airfields substantially affect the planning and options of a commander and hence, their defence must always weigh in his mind.

### **Orchestration**

War is always a joint effort. The essence of air operational art lies in integrating airpower with surface and sub-surface forces in order to achieve the objectives of joint campaigns.<sup>31</sup> This blending and fusing of airpower with land and naval forces is often termed as 'orchestration', which constitutes the most crucial, but challenging part of air operational art. The three services—Army, Navy, and Air Force—have distinct capabilities, traditions, and cultures. Each approaches the employment of its forces differently, with its perspective on success shaped by these factors. For instance, armies usually focus on capturing enemy territory and dislocating or destroying the

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<sup>29</sup> Strange, *Centers of Gravity & Critical Vulnerabilities*.

<sup>30</sup> Kainikara, "Principles of War and Airpower."

<sup>31</sup> Price Bingham, "Aerospace Operational Art," in *Operational Art*, ed. Clayton Newell and Michael D. Krause (Washington, D.C.: Center of Military History United States Army, 1994), 65.



enemy's deployed forces which are in close contact or near proximity. Navies, on the other hand, due to their added freedom of movement, take a broader view of war and aim to influence activities both at high seas and narrow choke points to achieve their strategic objectives. Air forces enjoy even greater freedom of movement with the capability to strike the heartland of the enemy. Their target selection is thus reflective of their ubiquity and reach.

Different perspectives and priorities of these services can lead to issues in joint campaigns, especially when the air effort is limited. Misplaced priorities can lead to inefficient and wasteful application of airpower, and ultimately the failure to attain joint military objectives. Thus, an air commander needs to thoroughly understand the joint concept of operations that determines when and where a battle should be fought, based upon its value and contribution to the campaign's objectives.<sup>32</sup> This insight enables the air commander to balance and orchestrate the three main air campaigns which an air force undertakes, i.e. Counter Air, Counter Surface and Strategic Operations. In face of resource constraints, it becomes even more important to correctly decide when to raise the pitch of one campaign and ebb the other. However, limited resources do not imply that a particular campaign is completely excluded. The potential of airpower must be exploited in all the roles but only according to the existing priority. At a lower level, orchestration of airpower also refers to maintaining an optimum balance between offensive and defensive efforts. This would depend upon strategy, and the manner in which the main battle is unfolding.

### **Synchronisation**

'Synchronisation' entails organising the air effort in time and space with an aim to achieve concentration and consequently, the desired effects on targets. Speed and reach which are the primary attributes of airpower facilitate prompt concentration of forces in time and space at the selected points. Combined with enormous firepower and enabled by precision weaponry, concentrated airpower is able to influence the operational environment. The traditional TSR matrix, which is a vital framework for the execution of land operational art has a slightly different context in air warfare. In the following paragraphs this matrix is explained.

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<sup>32</sup> Bingham, "Aerospace Operational Art."



### *Time*

The inherent slow movement of land manoeuvres makes it difficult to catch up on time delays. This limitation can make an otherwise potent group of land forces ineffective if it is spaced out in time. On the other hand, airpower, by virtue of speed, is able to compress and, ultimately, influences time. Thus, as mentioned earlier, the concept of dislocation does not apply to air forces in the classical sense. Additionally, the tempo of air operations, which is a function of sorties in a given time can be regulated. This variable allows the generation of more effects in a given time. While an air commander may exercise the option of enhancing the tempo of operations, such periods are difficult to sustain and thus require good judgement.

There is yet another dimension of time with regards to air operations. The decision-making framework, developed by John Boyd, consisting of four stages, including Observation, Orientation, Decision, and Action, abbreviated as OODA loop, is mainly a function of time. The side which is able to create an ascendancy in the cycle, by shortening the loop, gains a decisive advantage by overwhelming the enemy. The intrinsic attribute of airpower allows more opportunities to exploit the OODA loop.

### *Space*

In land warfare, space refers to the 'physical dimensions and extent in which objects and events exist and interact.' The armies' potential to exploit space is often constrained by their slow speed, presence of obstacles and deployed enemy forces. Conversely, airpower possesses, both reach and speed to influence activities at far off distances, unhindered by terrain restrictions.<sup>33</sup> While airspace may be unrestricted, the whole of it cannot be controlled or influenced permanently. An air commander has to choose relevant sectors for air control at the required time periods. Besides other variables, this selection also depends upon the own and enemy's land and sea manoeuvres. Hence, close coordination with other services is needed to make the correct decision.

### *Relative Strength*

Relative strength denotes the presence of own forces against those of the enemy at a particular place and time. Ensuring superior relative strength is the core task of a

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<sup>33</sup> Ministry of Defence, *Joint Doctrine Publication 0-30, UK Air Power*, report (United Kingdom Ministry of Defence, September 2022, Third Edition), 4, [https://assets.publishing.service.gov.uk/media/636baad0d3bf7f1649c4e36d/UK\\_Air\\_Power\\_JDP\\_0\\_30.pdf](https://assets.publishing.service.gov.uk/media/636baad0d3bf7f1649c4e36d/UK_Air_Power_JDP_0_30.pdf).



commander. Relative strength is not merely a function of numbers but would also depend upon the availability of better technology and force multipliers. Airpower, due to its inherent attributes, provides easier opportunities to achieve favourable relative strength.

## Leveraging Technology

Technology has always been an important enabler of military operations. However, new advances in technology in recent decades have significantly altered the conduct of military operations. Airpower, especially, has emerged as the domain most influenced by the advent of new technology. Optimal benefit of these technologies, however, is only possible through their proper assimilation and integration in airpower doctrines and strategies, along with requisite organisational changes. An air commander needs to be well versed in the art of leveraging the available technology most effectively in support of his strategic objectives. This paper is directed at describing the fundamentals of air operational art, and as such, detailed discussion on all advanced technologies which can possibly complement traditional air operations is beyond its scope. However, three technologies (Space, Cyber and Electronic Warfare), which stand out in their value to air operations are discussed in the following sections.

### Space Technology

Even though air and space constitute a seamless continuum, the characteristics of space are entirely different from those of air. Space is, therefore, considered a separate geographical medium like land, sea and air, where military operations can be conducted. However, at the operational level of war, space capabilities can provide the same 'high-ground' effects as provided by aerial platforms, though by using different means.<sup>34</sup>

An air commander, therefore, must fully understand, and be equipped to integrate space capabilities to optimize air operations. There are a variety of domains in which space capabilities provide valuable contributions to air operations. These include Intelligence, Surveillance and Reconnaissance (ISR), satellite communication, Positioning, Navigation and Timing (PNT), launch detection, missile tracking and

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<sup>34</sup> Air University, 'Five Myths about the Term Aerospace,' November 18, 2024, <https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Chronicles/rife.pdf>.





environmental monitoring for military operations.<sup>35</sup> These capabilities not only tend to enhance the effectiveness of air operations significantly, but also provide opportunity for faster and more informed decision-making. Increasing commercialisation of space assets provides further opportunities and incentives to exploit the medium of space.

### **Cyber Technology**

Cyberspace has emerged as the fifth domain of warfare, which is peculiar in the sense that it pervades all the four geographical domains discussed earlier. Cyber operations impact the conduct of warfare profoundly through effects ranging from psychological operations at one end to physical damage at the other. The attack on Iranian nuclear facilities through employment of Stuxnet malware in 2010 amply demonstrates the potential of physical destruction through cyber means. The ability of cyber-attacks to immobilise the enemy's critical functions, especially, related to command and control, hugely augments the kinetic operations undertaken by air forces. Effective integration of cyber operations with air operations, however, is often challenging and requires elaborate coordination. Success also depends upon the resilience of an enemy's network. The air commander must remain cognizant of the available potential of cyber capabilities, along with its challenges in order to plan integrated operations.

### **Electronic Warfare (EW)**

The use of electro-magnetic spectrum (EMS) has remained an integral part of air warfare since World War II. However, latest advancements in EW systems provide new opportunities to counter the ever-growing threat environment for aerial and ground targets while adding to their survivability and lethality. EW is relevant to all airpower roles in achieving mission effectiveness and success.<sup>36</sup> While EW can be employed from the land and sea domains as well, the third dimension, actually tends to add to the capabilities and effectiveness of EW itself.<sup>37</sup> Besides traditional roles, EW capability also provides the most cost-effective and efficient countermeasure against drones and loitering munitions, which are witnessing growing relevance in modern air warfare, by jamming or severing their link with the operator or the global

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<sup>35</sup> Curtis E. LeMay Center for Doctrine Development and Education, "Space Support to Operations," Air Force Doctrine Publication (AFDP) 3-14 Counterspace Operations (LeMay Center, January 25, 2021), [https://www.doctrine.af.mil/Portals/61/documents/AFDP\\_3-14/3-14-D06-SPACE-Support-Ops.pdf](https://www.doctrine.af.mil/Portals/61/documents/AFDP_3-14/3-14-D06-SPACE-Support-Ops.pdf).

<sup>36</sup> Donald Woldhuis, *The Path to 5<sup>th</sup> Generation Warfare-The Rising Impact of Electromagnetic Spectrum Operations* (Canberra: Air Power Development Centre, Department of Defence, 2018), 17.

<sup>37</sup> Woldhuis, *The Path to 5<sup>th</sup> Generation Warfare*, 17.





positioning system (GPS). Induction of Directed Energy Weapons (DEWs), which use highly focused energy including lasers, microwaves and particle beams to damage and destroy their targets, are yet another addition to the increasing role of EMS in present day air warfare. All these opportunities presented by the EMS make it incumbent for the air commander to integrate available EW capabilities in the most optimal manner.

## Attrition

War is a rational activity which implies that it is only worth pursuing if the objectives are worth its cost factors.<sup>38</sup> Attrition in air combat is a part of the overall cost of war which must be deliberated by an air leader. Attrition management, thus, becomes an essential consideration in the practice of operational art, especially, because both the aircrew and air assets are limited and cannot be replaced in war. Attrition, however, is an unavoidable part of war that cannot be completely eliminated. Strict adherence to military objectives is necessary to control wasteful air effort and the associated attrition. Sound tactics and intelligent use of technology also help to minimise attrition.

## Linkage with Tactics

Operational art is frequently termed as a 'bridge between military strategy and tactics.'<sup>39</sup> It draws strategic aims and objectives from military strategy while serving as the driver for tactics - 'Through operational art, the commanders organise tactical actions within the framework of time, space and purpose so that actions in pursuit of strategic objectives can take the most optimal form.'<sup>40</sup> With regards to airpower, there exists a stronger correlation between operational art and tactics, traditionally, because of centralised control. However, an air leader does not devise tactics; he only ensures an operational approach which is in conformity with standard tactics. This would

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<sup>38</sup> Christopher Rizzo, *The Cost-Benefit Calculation Model: Is it a Useful Tool to Analyse War Termination* (Fort Leavenworth: School of Advanced Military Studies United States Army Command and General Staff College, 1997), 2.

<sup>39</sup> Blythe, "A History of Operational Art," 40.

<sup>40</sup> Higuchi Shunsaku, "Operational Art and Tactics of the United States Army," (paper, Military History Division, Washington, D.C., 2021), [https://www.nids.mod.go.jp/english/publication/briefing/pdf/2021/briefing\\_e202106.pdf](https://www.nids.mod.go.jp/english/publication/briefing/pdf/2021/briefing_e202106.pdf).

require more familiarity with the tactics and a greater appreciation of tactical situations.

## Command and Control

The term 'Command and Control' implies two functions – 'a command authority which sets the tasks for air force, and a control authority to see that these tasks are carried out.' These are two distinct and crucial functions which require effective organisational structure. Usually, such a command and control organisation will have three components – 'Commander, his staff and the facilities required to support their functions',<sup>41</sup> which would include an operations centre and full range of communications. While a properly structured organisation is necessary to exercise command and control, the function itself is, like operational art, much more than a set of fixed procedures. It is an art which requires insight, judgement and experience of the commander and his staff. Most nations have resorted to the practice of having a joint headquarters for joint planning and conduct of war. In the absence of a functional joint headquarters, viable communication, between the three services, is mandatory for synchronisation of war efforts.

Technology has made profound impact on command and control functions in modern times. While it provides robustness and redundancy, which are critical requirements for these organisations, it has also made over-centralisation possible due to prompt availability of information. In this context, the two most enduring principles including 'centralised command' and 'decentralised execution' must continue to guide air operations.

Centralised command promotes integrated effort and enables air forces to meet the established priorities. It also allows air action to respond to changing situations and be concentrated at critical time and places to achieve decisive results. Centralised command prevents airpower from being divided into small sections which lack power and flexibility. The command and control must be exercised from the highest practical level. The higher the level, the greater is the unity of effort. However, there are factors which sometimes restrain control from the highest level. Some of these factors include the commanders' operational responsibilities, composition and capabilities of the air

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<sup>41</sup> Vallance, *The Air Weapon, Doctrines of AirPower Strategy and Operational Art*, 56.



forces, the reach and capabilities of air assets. In such conditions, the responsibilities related to planning and coordination could be delegated to 'dispersed locations or subordinate echelons to achieve an effective span of control and to seize the initiative, particularly in physically or electronically contested environments,'<sup>42</sup> However, the task of execution which relates to implementing actual plans and orders of air operations developed by the controlling authorities must be delegated at the tactical level. This facilitates effective on-the-spot decision-making during rapidly changing situations and unforeseen circumstances and allows exploiting the 'fleeting opportunities in dynamic situations.'<sup>43</sup>

## Military Education

Military education is more of an enabler than an element of operational art, which promotes its better understanding and practice. There is a growing realisation in many countries of the world for the need to broaden the scope of military education by adding increased elements of social sciences.<sup>44</sup> The aim of these initiatives is to 'widen the outlook from specialist areas of technical expertise, towards a more balanced coverage of wider strategic issues, requiring a level of analytical and conceptual thinking.'<sup>45</sup> The social sciences tend to strengthen the basis of critical thinking which is central to the conduct of operational art. Conventional thinking and outdated methodology which is marred by dogmatic constraints is inadequate to tackle the issues created by the complex and volatile environments which define conflict in present times. A balanced social sciences curriculum can provide the necessary capacity to commanders to skilfully confront the various dimensions of prevailing environments.

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<sup>42</sup> Sandeep Mulgund, "Evolving the Command and Control of Airpower," *Wild Blue Yonder*, April 21, 2021, <https://www.airuniversity.af.edu/Wild-Blue-Yonder/Article-Display/Article/2575321/evolving-the-command-and-control-of-airpower/>.

<sup>43</sup> Mulgund, "Evolving the Command and Control of Airpower."

<sup>44</sup> Paul Lieber and W.S. Hoverd, "Reinventing Social Science in the Military: Lessons Learned from the United States and New Zealand," *PRISM* 7, no. 1 (2017): 141-149, <https://ndupress.ndu.edu/Media/News/News-Article-View/Article/2031317/reinventing-social-science-in-the-military-lessons-learned-from-the-united-stat/>.

<sup>45</sup> Lieber and Hoverd, "Reinventing Social Science in the Military."



## Conclusion

Operational art is a relatively new concept in military literature, especially in the West, which adopted it from the Soviet military. Operational art is the skill necessary to plan and conduct major operations and campaigns with a view to accomplishing strategic objectives in a theatre. It is termed as an art rather than science, as it requires creative attributes of a commander. Operational art is not an extensively debated subject in airpower literature, and it is often explained using the borrowed terminology from land warfare. In the context of airpower, air operational art must be practiced within the framework of time-tested employment principles. The commander certainly needs to be well versed in airpower theory and organisational doctrine while being able to use his creative imagination and inner eye to marshal his resources to achieve strategic objectives.

There are various elements of air operational art which differ considerably from the elements of operational art of land warfare. Correct identification and targeting of enemy Centres of Gravity, orchestration of airpower with land and naval forces and its synchronisation at the right places and at the right times constitute the three most important elements of air operational art. In addition, new technologies, especially related to the domains of space, cyberspace and electromagnetic spectrum must be leveraged optimally to enhance the effectiveness of air operations. Finally, a sound and robust command and control centre is needed for integrating the functions of airpower, effective use of its capabilities, providing direction and enabling informed decision-making.





## **ABOUT THE AUTHOR**

***Air Marshal Farooq Habib (Retd)*** joined the Centre for Aerospace & Security Studies, Islamabad as Senior Director in February 2022. A graduate of National Defence University and Air War College, he has 36 years' experience of military aviation as fighter pilot in the Pakistan Air Force (PAF). He holds Master's Degrees in Strategic Studies and Defence & Strategic Studies. During his service with the PAF, he has held various Command and Staff appointments including Commandant of Air War College, Deputy Chief of Air Staff Training, Deputy Chief of Air Staff Personnel and Vice Chief of Air Staff. He has also commanded the first contingent of Pakistan Aeronautical Complex to the Kingdom of Saudi Arabia. An alumnus of the Inouye Asia-Pacific Center for Security Studies (USA), his areas of expertise include national security with emphasis on traditional security threats and response options; doctrine and policy; governance and public policy. He lectures regularly at National Defence University and Air War College on related subjects. He is a recipient of Hilal-i-Imtiaz (Military) for his services to the PAF.

## ABOUT CASS

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