SUPPORTING AND ENABLING: AIR-LAND CROSS-DOMAIN
LESSONS FROM MAJOR CONFLICTS

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MASTER OF MILITARY ART AND SCIENCE
Art of War Scholars

by

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Current and forthcoming US military concepts stress the need for integrating and synchronizing effects across all domains to achieve cross-domain synergy. This thesis examines three case studies to determine the effectiveness and means by which militaries synchronized airpower and land power during large-scale combat between peer competitors. Since the American and British experiences in World War II and Desert Storm are already well researched in US academia, research focused on Germany and the Soviet Union during World War II as well as the Israeli Defense Forces in the 1973 Arab-Israeli War. For each case study, the author presents the operational theory underpinning the studied military's conduct, a background of the campaign, a conclusion regarding overall effectiveness, and a thorough discussion of the command and control mechanisms used. The final chapter puts forth six distinct lessons the US should consider when developing systems and perceptions for Multi-Domain or All-Domain Operations.

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statement.)

ABSTRACT

SUPPORTING AND ENABLING: AIR-LAND CROSS-DOMAIN LESSONS FROM MAJOR CONFLICTS, by Maj E. Aaron Brady, 190 pages.

Current and forthcoming US military concepts stress the need for integrating and synchronizing effects across all domains to achieve cross-domain synergy. This thesis examines three case studies to determine the effectiveness and means by which militaries synchronized airpower and land power during large-scale combat between peer competitors. Since the American and British experiences in World War II and Desert Storm are already well researched in US academia, research focused on Germany and the Soviet Union during World War II as well as the Israeli Defense Forces in the 1973 Arab-Israeli War. For each case study, the author presents the operational theory underpinning the studied military's conduct, a background of the campaign, a conclusion regarding overall effectiveness, and a thorough discussion of the command and control mechanisms used. The final chapter puts forth six distinct lessons the US should consider when developing systems and perceptions for Multi-Domain or All-Domain Operations.

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ACRONYMS

AD	Area-Denial
ADD	Long-Range Aviation, *Aviatsii Dal'nego Deistviia*
AI	Air Interdiction
ALO	Air Liaison Officer
ASOC	Air Support Operations Center
BCD	Battlefield Coordination Detachment
CJTF	Commander, Joint Task Force
CP	Command Post
EMS	Electromagnetic Spectrum
FSCL	Fire Support Coordination Line
GLD	Ground Liaison Detachment
IADS	Integrated Air Defense System
IAF	Israeli Air Force, *Kheil HaAvir*
IDF	Israeli Defense Force, *Zeva Hsganch LeIsrael*
ISR	Intelligence, Surveillance, and Reconnaissance
JAOC	Joint Air Operations Center
JFACC	Joint Force Air Component Commander
JP	Joint Publication
JTAC	Joint Terminal Attack Controller
JTF	Joint Task Force
MDO	Multi-Domain Operations
OCA	Offensive Counterair (USAF Doctrine Annex 3-01)
OKH	German Army High Command, *Oberkommando des Heeres*
OKL	German Air Force High Command, *Oberkommando der Luftwaffe*

OKW	German Armed Forces High Command, *Oberkommando der Wehrmacht*
OPCON	Operational Control
PVO	Soviet Anti-aircraft Defense, *Protivo-Vozdushnaia Oborona*
SA	Strategic Attack
SAM	Surface-to-Air Missile
SEAD	Suppression of Enemy Air Defenses
TACON	Tactical Control
TACP	Tactical Air Control Party
TTP	Tactics, Techniques, and Procedures
USA	United States Army
USAF	United States Air Force
USJF	United States Joint Force (meaning the totality of US military forces, as defined in *Joint Concept for Integrated Campaigning*)
USMC	United States Marine Corps
VVS	Soviet Air Force, *Voenno-Vozdushniie Sili*

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CHAPTER 1

INTRODUCTION

To conduct Multi-Domain Battle, all domains and warfighting functions are integrated to deliver a holistic solution to the problem.
—General David Perkins, *Multi-Domain Battle*

Interoperability is the critical attribute that will allow commanders to achieve the synergy from integrated operations…Interoperability refers not only to materiel but also to doctrine, organization, training, and leader development…It should exist among Services and extend across domains and to partners.
—Joint Chiefs of Staff, *Capstone Concept for Joint Operations: Joint Force 2020*

Background

When a conflict ends, militaries tend to analyze their experiences, the world around them, and their perceptions of the future to determine what the next war might look like and, more importantly, how to win it. The US Joint Forces (USJF), especially the US Army (USA) but with ample commitment from the US Marine Corps (USMC) and US Air Force (USAF) are working together to develop Multi-Domain Operations (MDO) as a means to deter and, if necessary, defeat a numerically superior adversary with a combat system designed explicitly to defeat the USJF model used so successfully in major operations over the last thirty years. When considering how to implement a concept like MDO, the USJF should closely examine the underlying principles that have allowed peer competitors to effectively integrate domain forces during historical conflicts.

This thesis therefore examines the means by which Germany, the Soviet Union, and Israel integrated airpower and land power during World War II and the 1973 Arab-

Israeli War.* Given that the land part of these campaigns are well-researched, the preponderance of research effort is placed towards understanding the role of air forces in these cases. Through examination of these conflicts as well as including already well-researched lessons from American and British experiences during World War II and more recent conflicts, foundational cross-domain principles may be identified. While these principles will emphasize integrating airpower and land power, there are likely numerous concepts that apply equally to the other domains. Keeping these principles in mind when developing the structures and processes of the US joint system improves the likelihood of military success for the United States. Prior to delving into the analysis of the historical cases, a brief discussion of MDO, joint functions, and the role that tempo plays in warfare facilitates a common perception of the issues.

Multi-Domain Operations and Contested Operational Environments

Several years ago, USA and USMC began a joint effort conceptualize ground conflict against a peer adversary in the 2025-2040 timeframe.[1] This concept evolved into MDO. The underlying assumptions behind MDO included aggressive peer actions challenging US and allied interests while seeking to avoid decisive US intervention. As this theory spread from the two land-centric services to the rest of the USJF, the perception of war is adjusting, most notably with the advent of the competition continuum. During competition short of armed conflict, the USJF must present a credible conventional deterrent to peer competitors. If an armed conflict does occur, the USJF

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* Throughout this thesis, airpower is written as one word per US Air Force policy.

must be poised to deny, degrade, or preferably defeat, a peer adversary. This thesis focuses exclusively on conflict.

During conflict with a peer adversary, a key part of any discussion of MDO includes the contestation of the air domain. Adversaries seek air control predominantly through complex integrated air defense systems (IADS) composed of advanced surface-to-air missiles (SAMs), sophisticated fighters, and potent electronic warfare capabilities.[2] Over the last several decades, the USJF grew accustomed to the USAF gaining and maintain air superiority—if not air supremacy—within just a few short days. In potential future conflict against a peer adversary, it is possible the USJF may never achieve sustained air superiority. The *Joint Operational Access Concept* discusses these issues at length. Rather, the USJF may need to fight for windows of local air superiority, achieve the desired effects, then cede the air domain back to a neutral or even enemy-controlled state. Given the prevalence of fires, especially aerial fires, in current USJF tactics, suddenly losing the ability to strike the enemy at will throughout his combat depth and into his national heartland demands conceptual analysis of airpower employment.

This discussion yields two points that help frame further analysis. First, MDO is the cognitive approach by which the USJF intends to defeat peer adversaries. Second, the limited windows of air superiority mean that the USJF must reassess the means by which airpower is employed, especially as it pertains to integrating airpower and land power. While these issues present a myriad of problems to address, this thesis examines only certain parts. To limit the scope of the analysis, the issues are examined through a lens defined by the joint functions.

The Joint Function Lens

To appropriately limit the scope of study as well as focus on integration of air and land fires and maneuver, this thesis views the cases through three Joint Functions: command and control (C2), maneuver, and fires. C2 is the primary focus since such structures are foundational to effective integration and synchronization.[3] Without effective C2, maneuver and fires in one domain are extremely hard-pressed to achieve notable effects either within their domain or in another domain. The USAF even identified Multi-Domain C2 (MDC2) as its first core mission in its *Future Operating Concept 2035*.[4] The integration and synchronization provided by C2 produce combat effects through maneuver and fires.

Maneuver is "movement in combination with fires to achieve a position of advantage in respect to the enemy."[5] One should note that maneuver is possible in all domains—it is not limited to land or sea. Joint fires are effects delivered by two or more services and are vital to enabling maneuver.[6] These two functions are the means by which one combat system imposes effects on an enemy system.

The remainder of this thesis focuses on developing cross-domain principles to maximize the effectiveness of air-land integration within these functional areas. Effective application of these joint functions should allow for freedom of action across all domains, as opposed to forcing the forces of one domain to delay action while waiting on direction from the other domain.

Freedom of Action Leading to Initiative

A common thread in US military thinking is a desire to provide freedom of action to subordinates. The USA's mission command philosophy or the USAF's decentralized

execution aim to accomplish this. In both cases, the underlying principle is that freedom of action allows initiative.[7] If leaders understand the purpose of their missions, providing freedom of action allows them the initiative to make decisions in a changing environment at their level as opposed to waiting for higher headquarters to provide direction. Another way of looking at the concept of initiative revolves around opportunity.

Leaders possessing freedom of action may utilize initiative to grab opportunities and generate successes. Consider that "the outcome of a military endeavor can turn on the exploitation of opportunity."[8] Since opportunities are often fleeting, greater freedom of action allows a leader to take advantage of the opening. A leader forced to wait for authorization may see the occasion pass prior to receiving authority to act. Therefore the result of freedom of action and initiative is the ability to make and act upon timely decisions thereby establishing a more rapid tempo.

Tempo

Joint doctrine and USAF doctrine both refer to tempo but only USA doctrine defines it—"the relative speed and rhythm of military operations over time with respect to the enemy."[9] US Joint Publication 1 describes the importance of tempo as:

> the [Joint Force Commander] can make timely and effective decisions to get inside the adversary's decision and execution cycle. Doing so generates confusion and disorder and slows an adversary's decision making. The commander who can gather information and make better decisions faster will generate a rapid tempo of operations and gain a decided advantage. Consequently, decision-making models and procedures must be flexible and allow abbreviation should the situation warrant it.[10]

The USAF further describes the importance of tempo, noting that airpower has the capacity to provide temporal advantages over an adversary thus producing paralysis within the enemy's combat system.[11] A model commonly known in the USAF that

summarizes this concept is the OODA Loop. Invented by John Boyd, the idea of Observe-Orient-Decide-Act (hence, OODA) was first applied to aerial dogfighting, but the connection between this model and warfare more generally is readily apparent.[12] Whichever side can assess the situation, adjusting the plan, and execute more rapidly will theoretically quickly create a significant advantage over an adversary.

Putting all of these points together yields the goal of cross-domain principles this thesis presents. The principles should guide the design of joint operational and tactical C2 structures. Those structures should provide freedom of action across domains for maneuvers and fires. That freedom of action allows leaders to take initiative which in turn establishes a rapid and effective multi-domain tempo. Figure 1 below illustrates this concept. Acceptance of this theory implies a corollary: disrupting an enemy's ability to act breaks down the enemy's tempo, thus gaining an even greater advantage for oneself.
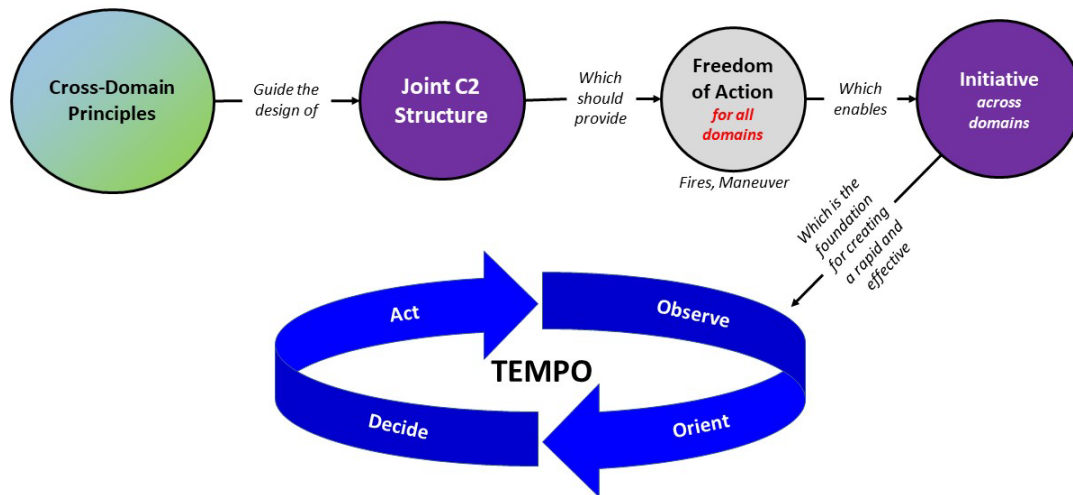
Figure 1.   Principles to Tempo Concept

Source: Created by author.

Risk

While freedom of action is the goal for C2 systems, the risk of fratricide is a significant concern when considering freedom of action across domains. Joint structures and the degree of initiative allowed should be tempered by appropriate risk mitigation procedures. The concept illustrated above should be amended to demonstrate that the tempo must be tempered, to a minimum acceptable degree, to mitigate risk.
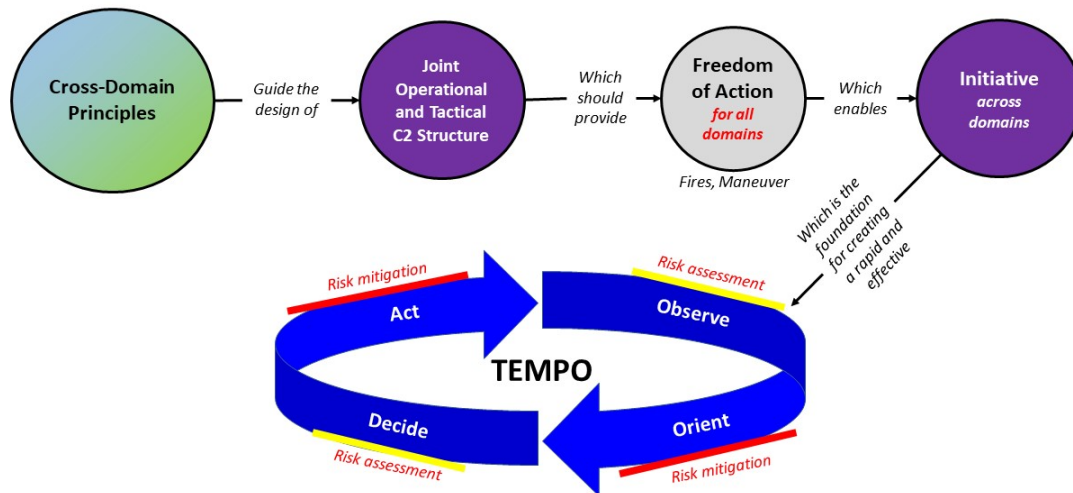
Figure 2.   Principles to Tempo Tempered by Risk

Source: Created by author.

Historical Analysis to Derive Principles

Accepting these concepts, the USAF must look to historical examples of airpower to assess its current paradigm. In the cases of contested Strategic Attack (SA) and Air Interdiction (AI), there are ample conflicts to examine. Virtually every conflict US air

forces participated in since 1917 contained SA or AI campaigns in a contested environment. However, examples of USAF aerial fires and maneuver working in close conjunction with ground maneuver in a contested air domain are sparse. Most of the World War II campaigns between 1942 and 1945, Korea in 1950-53, and perhaps Operation Desert Storm in 1991 fit the criteria. While lessons were learned during these conflicts, these American cases are amply represented in US military academe. The USJF benefits from studying the histories of other militaries to derive a more holistic view of developing synergy between airpower and land power in peer conflicts.

In order to select historical experiences for study, one must first identify conflicts in which adversary capabilities were sufficient to present a contested environment to one another's operations. Next, the conflict must display a level of integration of airpower and land power worthy of deeper investigation. These conflicts were characterized by land forces and air forces of similar scale engaged in relatively continuous conflict and with sufficiently sophisticated militaries to develop structures expressly designed for integrated airpower and land power. Finally, enough sources are required to gain the requisite information needed for theoretical framework analysis. Upon review, three conflicts meet these criteria handily. Although other conflicts might also be beneficial for review, the limits of time and resources prevent a larger study.

The German invasion of France in 1940 and German operations in Russia from 1941-43 present a blend of airpower and land power coordinating in the first major armored maneuver campaigns. These campaigns feature essentially peer armies as well as peer or near-peer air forces. British and French air forces and especially air defenses were equivalent to their German counterparts, especially from a materiel perspective. While

the Soviet Air Force (VVS) was arguably a poor match for the Luftwaffe in 1941, the Soviet air defenses were more than capable through the 1941-43 period. Further, by 1943 the VVS was matching the capabilities of the Luftwaffe.

The Soviet campaigns from the end of 1942 to mid-1944 represent a similar environment to that already described above. The Red Army and German Army fought large-scale combat operations throughout the Eastern Front of World War II with neither side able to sustain significant and sustained advantage on the land or in the air until 1944. Soviet operational art, well advanced in 1941, was honed by the continuous fighting between 1942 and 1945.[13] One could convincingly argue that by the end of the war the Red Army and the VVS set the world standard for airpower as part of maneuver warfare.

The Americans and British were not ignorant of effective close integration between air and land. The primary difference between the western allies and the Soviet Union in this regard was simply one of scale and scope. The allies fought sustained land campaigns with closely integrated airpower for only about ten months between June and April 1944. At worst, the skies over France and the Low Countries in 1944 were neutral; the Germans could not influence Allied air maneuver appreciably meaning that the Allies had air superiority. In contrast, the Soviets were fighting near-continuous major land operations from June 1941 until the end of the European war in May 1945. More importantly, American CAS and broader air-land integration concepts developed in West Europe during 1944 and 1945 have been exhaustively researched. This study therefore presumes the reader is broadly familiar with the lessons derived from western allied experiences.

This study likewise presumes the reader is broadly familiar with the characteristics of the American wars in Korea and Vietnam. Neither of those wars are examined for similar reasons to the American experience in World War II. In the case of Korea, while the conflict meets the three criteria for selection, this war, like the American operations in France, has been extensively researched. Vietnam, on the other hand, does not meet the criteria for contested operations. While operations in North Vietnam were certainly contested, there were no US or South Vietnamese land forces present in that portion of the theater.

Few conflicts in other portions of the world during the 1950s and 1960s met the contested criteria. Most of the conflicts in the 1950s and 1960s were small, limited wars between powerful states and insurgencies. The Indo-Pakistani Wars were certainly contested environments, but English-language sources are too limited to support critical analysis.

The Yom Kippur War in 1973 is both well-documented in English and represents a notable clash in the 20th Century. The war represents the first major land campaign that occurred in conjunction with modern, missile-based and integrated air defenses. Only the Israeli operations will be assessed since the Egyptian and Syrian air operations against Israeli forces were limited in comparison. This war is also important to look at since it played a major role in defining USAF and USA theoretical thought over the next two decades.[14]

This thesis does not delve into the American or British experiences most applicable to the topic—namely the two air forces during World War II and Desert Storm. These various campaigns are extensively researched and discussed in American

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literature and especially by the USAF. Based on that, this thesis does not investigate those conflicts but will, for the purposes of final recommendations, assume that the reader is familiar with air and land operations during Desert Storm.

Comparison of the individual case study analyses allows derivation of effective air-land cross-domain principles. To achieve this result, the described background and conceptual framework lead to the primary research question.

Research Question

This thesis answers the following question: What principles can the USJF derive from historical contested conflicts regarding the effective integration of airpower and land power? With such principles in hand, the USJF will be able to apply various means to achieve the effective integration of the air and land domains.

"Effective," "Contested," and Other Important Definitions

The terms "effective" and "contested" as well as several others are highly subjective, but also critical to the scope of this study. Current joint or service publications define all other terms. However, neither the term effective nor contested are defined in any of the Department of Defense sources.

Effective is a moderately vague term used throughout this paper. This author developed a definition derived from several influences. Millett, Murray, and Watman wrote that "military effectiveness is the process by which armed forces convert resources into fighting power" with the implied meaning that fighting power is associated with delivering specific effects.[15] Stephen Biddle declared that military effectiveness is the ability to produce favorable military outcomes.[16] Within the context of the research question, "effective" shall be defined as either success in achieving the desired effect or

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achieving an unintended effect or effects that meaningfully contributed to the outcome of a battle or operation.

The word "contested" is also relatively vague. "Contested" within this paper means an enemy combat system organized, trained, equipped, and deployed to deliver robust area-denial (AD) capabilities across one or more domains utilizing both kinetic and non-kinetic means. The *Joint Operational Access Concept* defines AD as "those actions and capabilities, usually of shorter range, designed not to keep an opposing force out, but to limit its freedom of action within the operational area."[17] Essentially, a contested environment is one in which the enemy's combat system denies freedom of action across one or more domains.

At numerous points, support relationships may be used to discuss the nature of integrated operations. Joint Publication (JP) 1 defines these terms. The current US support categories of close, direct, general, and mutual support terms shall be used to define the historical relationships as closely as possible. Direct and close support are the forms of support most often discussed in this paper. In both cases, one force operates in support of another. The key difference lies in the fact that, in direct support, the supporting force is placed under the control of the supported force. This contrasts with close support, in which the supporting force is operating sufficiently near the supported force that detailed integration is required but the supporting force is not necessarily under the control of the supported force.[18] Perhaps unsurprisingly, there are several similarities between the definitions of close support and CAS.

The definition of CAS is approximately one paragraph in length, but often Airmen in the Tactical Air Control Party and A-10 communities shorten it to two key

phrases: close proximity and detailed integration. Interestingly, by utilizing this common simplification, the definitions of close support and CAS are virtually identical. This highlights an issue that arose in the past two decades: the confusion of CAS as a mission with CAS procedures. All too often they are presumed to be synonymous. For the remainder of this paper, the phrase close support indicates the definitional term while the phrase CAS indicates the usage of specific tactics, techniques, and procedures intended to mitigate risk to friendly forces by air forces providing close support. With these common definitions in place, the analytical framework used throughout the study may be discussed.

<div align="center">Methodology and Subordinate Questions</div>

Objectively analyzing historical conflicts is exceptionally difficult given that in most circumstances the information available is subject to bias. Regardless, this study attempts to interpret the historical experiences as neutrally as possible, primarily by answering a series of subordinate questions. Each question is answered subjectively based on the author's analysis of the cases.

The first question is perhaps the most important—was the operation, particularly the air portion, successful? This will be judged based on two criteria. First, the campaign may be judged successful if it achieved or exceeded the objectives established by national or military leadership prior to the start of the campaign. Second, the associated air operations are deemed effective if they either delivered the desired effects or if unintentional effects provided meaningful contributions to the success of the overall campaign. If the operation was successful, then the author will examine the C2 system.

Given that the command and control system is the foundation for effective cross-domain synergy, this second question is the primary analytical focus. To this end, the second subordinate question is: What was the operational and tactical C2 structure? More specifically, what authorities, roles, and responsibilities were tasked or delegated to specific agencies within the examined services. Current US joint doctrine for air operations breaks the role of the Joint Force Air Component Commander (JFACC) into two broad categories, authorities and responsibilities.[19] Doctrinally, the authority discussion revolves around Operational Control (OPCON) and Tactical Control (TACON), terms defined in JP 1. The JFACC responsibilities focus on developing a Joint Air Operations Plan (JAOP), recommending air apportionment priorities, allocating forces, providing oversight and guidance during execution, and several other facilitatory functions.[20] One can apply these US doctrinal terms to historical C2 systems in an effort to better understand the inner workings of the structures.

Each aspect of the C2 structure defined in JP 3-30 is worth a cursory analysis with an emphasis on how that aspect contributed to operational tempo and effectiveness. The OPCON and TACON discussion may be simplified by identifying the chain of command of air units. Given that none of the militaries being investigated except the US military contended with the current US construct in which each service possesses significant air forces, there is no need to assess the specific doctrinal differences between OPCON and TACON. The JAOP "is the Joint Force Commander's plan to integrate and coordinate joint air operations…".[21] This responsibility may be summarized as the mechanism(s) by which a historical air component generated a concept of operations that integrated with other domains to achieve operational or strategic objectives. This study shall interpret

apportionment as the authority to prioritize mission sets such as Offensive Counterair (OCA), AI, Close Air Support (CAS). Allocation shall be considered the authority to task aircraft to missions and launch sorties. Providing guidance during execution delves into the upper levels of tactical C2.

Within the various tactical C2 constructs, three specific areas shall be examined: how were tactical air missions integrated into the overall scheme of maneuver and fires; how were targets acquired and assigned to aircraft; how was risk to friendly forces mitigated? This study will not delve too deeply into the detailed tactics, techniques, and procedures used by the various services studied. The goal is to assess the general concept underlying cross-domain risk mitigation techniques. Once this concept is derived, research progresses to the final subordinate question.

The final subordinate question assesses how the C2 structures enabled air and land forces to mitigate AD systems and thereby enable freedom of maneuver.[†] In most cases this question focuses on enabling air maneuver, but enabling land maneuver is also assessed where applicable. A key part of this issue is the means by which the forces integrated Offensive Counterair effects, emphasizing Suppression of Enemy Air Defenses (SEAD) from both the air and land domains.

Once each case study is analyzed via the above criteria, each system will be compared. Through this comparison, principles are derived. These principles are the primary purpose of this thesis. However, this thesis will make several recommendations applicable to doctrine, organization, training, and leadership for consideration by USAF

[†] Freedom of maneuver is differentiated from freedom of action in that freedom of action is the authority to act whereas freedom of maneuver is the ability to conduct movement in conjunction with fires without prohibitive interference from an enemy.

and USA leaders. The intent is potential solutions to some of the issues extant in MDO today without requiring significant financial or materiel investment.

<div align="center">Sources</div>

This study is based on both primary and secondary sources. The primary sources used include post-war analyses written by participants, official staff analyses, and memoirs. Primary sources from the World War II era are mostly memoirs or historical analyses written by German or Soviet participants. German sources include many USAF Historical Studies written by Luftwaffe generals. Some German pilot memoirs, such as *Stuka Pilot* by Hans-Ulrich Rudel, provide a tactical perspective. In many cases, it is possible to compare the German analyses with the appropriate British, French, or Red Army staff analysis to discern the perceived German effectiveness with actual effectiveness. Primary sources from the Yom Kippur War include memoirs by Israeli pilots, although these are limited in scope. The Israeli government and IDF members are more reluctant than most in releasing archival material, making studies of the 1973 war almost completely reliant on secondary sources.

Secondary sources for the World War II conflicts include US military foreign military studies such as the Karlsruhe Document Collection, and staff studies such as the Soviet General Staff operational studies. Secondary sources for the Yom Kippur War include histories of the Israeli Air Force (IAF) largely written by former Israeli pilots.

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[17] Joint Chiefs of Staff (JCS), *Joint Operational Access Concept* (January 2012), I, accessed 14 May 2019, https://www.jcs.mil/Portals/36/Documents/Doctrine/concepts/joac_2012.pdf?ver=2017-12-28-162010-227.

[18] JP 1, V-10.

[19] Joint Staff, Joint Publication (JP) 3-30, *Command and Control of Joint Air Operations* (February 2014), II-2, accessed 14 May 2019, https://www.jcs.mil/Portals/36/Documents/Doctrine/ pubs/jp3_30.pdf.

[20] Ibid., II-2-II-4.

[21] Ibid., III-2.

CHAPTER 2

WORLD WAR II – THE GERMAN ARMY AND THE LUFTWAFFE, 1940 TO 1943

> The mission of the military forces in war is to break the enemy will. The will of the Nation is most forcibly incorporated in its military forces. Defeat of the enemy military forces is therefore the primary objective in war. The mission of the Air Force is to serve this purpose through the conduct of air warfare within the pattern of the overall conduct of the war.
> —General of Fliers Paul Deichmann, *The System of Target Selection Applied by the German Air Force in World War II*

During the campaigns of 1939 and 1940, the German armed forces seemed to reassert their position as the "paradigm army" of the West.[1] While the Germans did not themselves use this term until well into the war, *blitzkrieg*, or "lightning war," became synonymous with decisive operations characterized by rapid and massive armored offensives supported by infantry, artillery, and overwhelming air forces. The German system worked exceedingly well in Poland and France and provided initial successes in the Soviet Union as well. No degree of operational and tactical excellence can overcome strategic miscalculation, however, and victory against the USSR eluded the Germans. By 1943, the German war machine culminated. The German combat system finally broke down in the steppes around Kursk in the summer of 1943 and never recovered. Regardless, the degree of success the Luftwaffe and German Army attained in the earlier portions of World War II warrant study. This chapter first summarizes and assesses the effectiveness of air-land integration during each campaign. Throughout the synopses and effectiveness discussions, take note of four common threads: trust between air and land leaders, a common understanding of the joint objectives, airpower considered as a maneuver force, and a flexible C2 structure enabling effective integration. These themes are discussed in detail at the end of the chapter.

Background

During World War I, the German Air Service (*Luftstreitkrafte*) pioneered dedicated attack units.[2] At the start of the 1918 Offensive, the Germans fielded 30 attack squadrons (*Schlachtstaffeln*) on the Western Front.[3] Some Junkers J.I attack aircraft were even equipped with radios, a habit highly unusual for the time. While the Germans conducted strategic attack campaigns utilizing Zeppelins and long-range bombers, Germany (like the Allies) emerged from the war with an appreciation for the importance of air-land integration.

Following defeat in World War I, the Treaty of Versailles restricted Germany from maintaining any air forces and armored forces. The Weimar German military managed to keep 180 airmen in the disguised General Staff, but they had few resources available.[4] Nevertheless, the Luftwaffe was able to develop doctrine and test aircraft in small numbers in the Soviet Union. The Luftwaffe exchanges with the USSR were prolific during the 1920s and early 1930s and resulted in significant cross-pollination of operational ideas between the Germans and the Red Army.[5] Hitler reconstituted the Luftwaffe in 1933 with essentially no aircraft and only minimal experience gained either in the Soviet Union or flying for *Lufthansa*. The newly formed Reich Air Ministry (followed soon by the Luftwaffe High Command or OKL, *Oberkommando der Luftwaffe*) endeavored to develop theory, establish an air war doctrine, and equip a force as rapidly as possible.

In 1935, the Luftwaffe published Regulation 16, *The Conduct of the Air War* (*Die Luftkriegführung*), which set forth German air doctrine through 1945 with only minor exceptions. The document listed seven missions for the Luftwaffe, including "air action

in support of the army forces" and "action to interdict routes of communication" as distinctly separate functions.[6] This publication notably lacked any prioritization of the various missions, not even ranking the achievement of air superiority as most important. Most Luftwaffe leaders and theorists, however, viewed strategic bombing as the mainstay of Luftwaffe missions.[7] Experiences during the Spanish Civil War suggested that sometimes close support deserved a higher priority than the Luftwaffe previously deemed prudent. Despite this, interdiction and strategic attack remained the primary mission of the Luftwaffe when World War II began.[8]

The Polish campaign in September 1939 established the German war machine as a potent threat to other European states. The Luftwaffe played a major role in the operation. The First and Fourth Air Fleets, comprising more than half the total Luftwaffe strength, eliminated the Polish Air Force as a threat within one day and then focused on army support.[9] The bulk of the Luftwaffe effort was AI (the Germans labeled it indirect support) and highly effective at disrupting Polish forces.[10] During this first campaign, though, coordination between the Luftwaffe AI efforts and the army maneuver occurred at very high levels, essentially as discussions between army group and air fleet staffs.

Only Wolfram von Richtofen's (a former cavalry officer) Special Purposes Air Command (*Fliegerführer zur besonderen Verwendung*) executed direct support, or CAS. The German CAS system at this time was very rudimentary. Early in the campaign, CAS assets attacked targets of opportunity with only a basic understanding of the German ground maneuvers. Target nominations from the Army were late or nonexistent. Later in the campaign, von Richtofen personally flew liaison planes to the field army headquarters, discerned the situation, and provided targets to his groups.[11] This simple

system was effective given the overmatch of the Germans against the Poles. The Germans greatly improved coordination and organization prior to the invasion of France in May 1940.

The French Campaign, May 1940

Campaign Synopsis

The Germans attacked into France and the Low Countries on 10 May 1940. Operation Yellow (*Gelb*), consisted of a thrust led by armored forces through the Ardennes Forest and thence along the Meuse River to the English Channel. Less powerful forces attacked into the Netherlands and Belgium to pin these armies as well as the bulk of the French and British forces in northern France. A final German army group fixed the French forces in the Maginot Line. The ultimate intent was to isolate the Belgian army as well as the large British and French forces expected to advance into the Belgian plains once the German attack began.

Two air fleets operated in conjunction with the three German army groups (A, B, and C, from north to south). The Second Air Fleet worked along the German right wing, primarily supporting Army Group A. The Third Air Fleet was responsible for the center and left wing, Army Groups B and C. The Second Air Fleet's area of operations (AO) was smaller and contained fewer interdiction targets so this fleet controlled fewer bomber units. Further, the Second Air Fleet initially owned the VIII Air Corps, the successor unit to the Special Purposes Air Command, which was the only unit in the Luftwaffe that specialized in close support.[12] Second Air Fleet assigned the corps to support the Sixth Army advance, expected to be arduous based on an extensive line of fortifications

between Maastricht and Liege. The primary concern of these Luftwaffe formations was to facilitate the maneuver of the army.

To enable other operations, the Luftwaffe certainly recognized the need for air superiority. Indeed, most of its initial attacks were against airfields. However, army support was conducted simultaneously to enable the overall tempo. The Second Air Fleet supported the advance of Army Group A through direct and indirect support. Perhaps more importantly, Second Air Fleet also strove to prevent reinforcement from the United Kingdom by attacking ports and infrastructure near the English Channel. The Third Air Fleet isolated northern France and supported the advance of Army Group B as well as conducting port strikes.[13] Figure 3 below shows the air maneuver plan superimposed on the land maneuver plan.
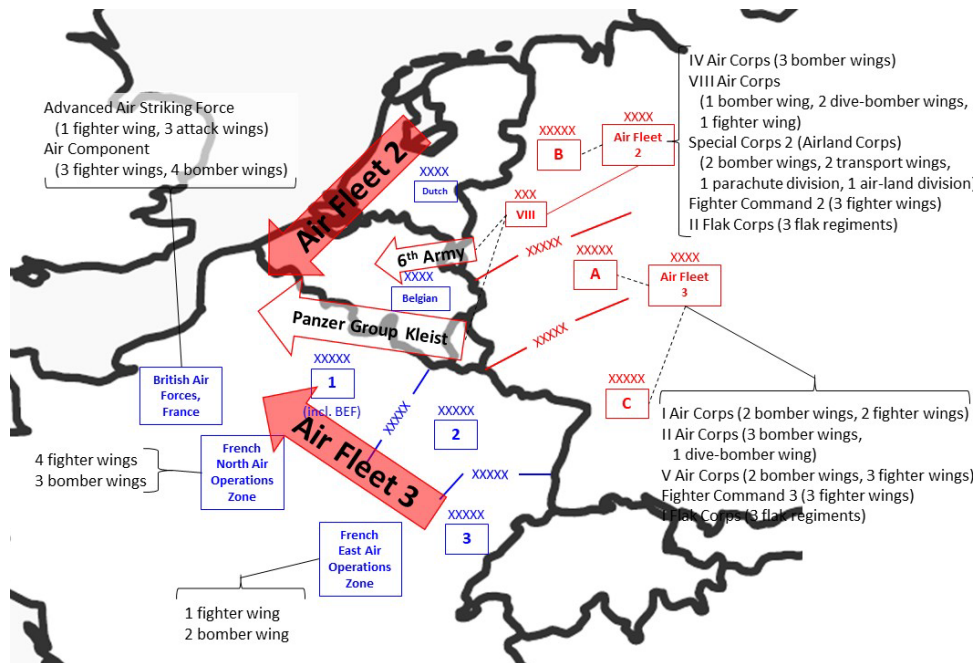
Figure 3.   Operation Yellow Air and Land Maneuver

Source: Created by author.

The allies primarily contested the air domain with air forces.[14] The air forces facing each other were approximately equal in strength. Table 1 below shows the comparative strength of the Luftwaffe as opposed to the Allied air forces as of 10 May 1940. Despite the relative numerical parity, in general the Luftwaffe aircraft were more advanced. Further, and perhaps more importantly, the Luftwaffe was centrally organized.

Table 1. Comparative Aircraft Strengths, Western Front 10 May 1940			
Aircraft Type	**Allies**	**Germans**	**Allied:German Force Ratio**
Fighters	1,151	1,264	0.91:1
Bombers & Ground-Attack (includes dive-bombers)	1,045	1,486	0.62:1

Source: Robert Jackson, *Air War over France, 1939-1940* (London, UK: Cox & Wyman, 1974), 134-137.

Despite heavy losses both in the air and on the ground, the German assault was quite successful. Poor coordination within and between the Allied air forces coupled with experienced Luftwaffe leaders and pilots allowed the Germans to gain air superiority over northern France and the Low Countries within a few days.[15] By 14 May, German units arrived in Rotterdam and crossed the Meuse River in several locations in France. On 21 May, the Germans isolated the British Expeditionary Force as well as the Belgian Army and French 1st Army in a shrinking pocket around Dunkirk, France.[16]

During this rapid advance, VIII Air Corps was the only unit that executed close support. During the first several days, VIII Air Corps facilitated the advance of Sixth Army through Belgium and past the heavy border fortifications. As it became more obvious to OKL that the decisive operation of the campaign would be Panzer Group von

Kleist attacking from the Ardennes, VIII Air Corps was shifted to Third Air Fleet to support the advance.[17] During the campaign, von Richtofen's air corps performed several vital activities that notably contributed to German success: screening advancing armor formations both in Belgium and France as well as participating in the massive aerial assault that set conditions for XIX Panzer Corps' Meuse crossing at Sedan.

In the first days of the campaign, Sixth Army drove north of Liége, bypassing the Belgian forces fortified there. As the panzers outran the marching infantry, the VIII Air Corps screened both the left and right flanks. While other air forces in World War II performed similar services to armies, this is perhaps the first example of a deliberate aerial screen. Several days later on 14 May, VIII Air Corps participated in a major II Air Corps operation near Sedan, France. The Germans executed a constant air attack against the French 55th Division with over 1,000 sorties during the crossing, a technique learned during the Spanish Civil War.[18] This attack neutralized French heavy artillery and largely prevented French reserves from reinforcing the area from the south and east.[19] The Luftwaffe's disruption of French forces allowed XIX Panzer Corps to establish a bridgehead south of the Meuse and prepare for its subsequent advance west.

Once across, the panzer group had no significant natural obstacles before it to achieve its objective of reaching the Channel coast and sealing the fate of the Allied forces in Belgium. Attacks by British and French forces along both flanks of the spearhead threatened the armored forces, but Luftwaffe integration prevented significant disruption of the German attack. Screening missions, mainly by VIII Air Corps but other elements of Third Air Fleet, played a major role in driving off attacks of the French 4th Armored Division on 17 and 19 May, amongst other flank covering operations.[20]

Throughout the campaign, the Luftwaffe generally kept true to its operational scheme with some exceptions. Fighters conducted both escort and sweep missions to establish air superiority. Bombers and ground-attack aircraft executed both CAS and AI (mostly AI except, to a degree, VIII Air Corps). These effects were integral to the success of the campaign.

<center>Effectiveness</center>

German cross-domain operations in France were effective for three primary reasons. Luftwaffe close support, especially flank screening operations, facilitated fast armor advances. Concentrated aerial attacks at critical points, often in conjunction with artillery fire, enabled breakthroughs on the ground which resulted in the collapse of major defensive lines. Finally, Luftwaffe interdiction efforts significantly disrupted the French ability to reinforce its forces in northern France. These three effects enabled the Germans to maintain a tempo the Allies were unable to contend with throughout the campaign.

The speed of the German advance, mainly achieved through massed armor formations, kept the operational initiative squarely with the Germans throughout May and June 1940. Luftwaffe screening efforts enabled the armor to advance with less concern for outrunning the supporting infantry.[21] VIII Air Corps' screen for Sixth Army around Liége and Third Air Fleet's screen of Panzergroup von Kleist's advance through northern France illustrate the criticality of this effect on the overall operation. Screening efforts were so successful that Guderian noted in his memoirs only that his headquarters was aware of the French division on their "open left flank" on 19 May.[22] On that day, the Luftwaffe successfully disrupted a major attack by de Gaulle's French 4th Armored Division on Guderian's flank.[23] Figure 4 below illustrates these screens.

<center>26</center>
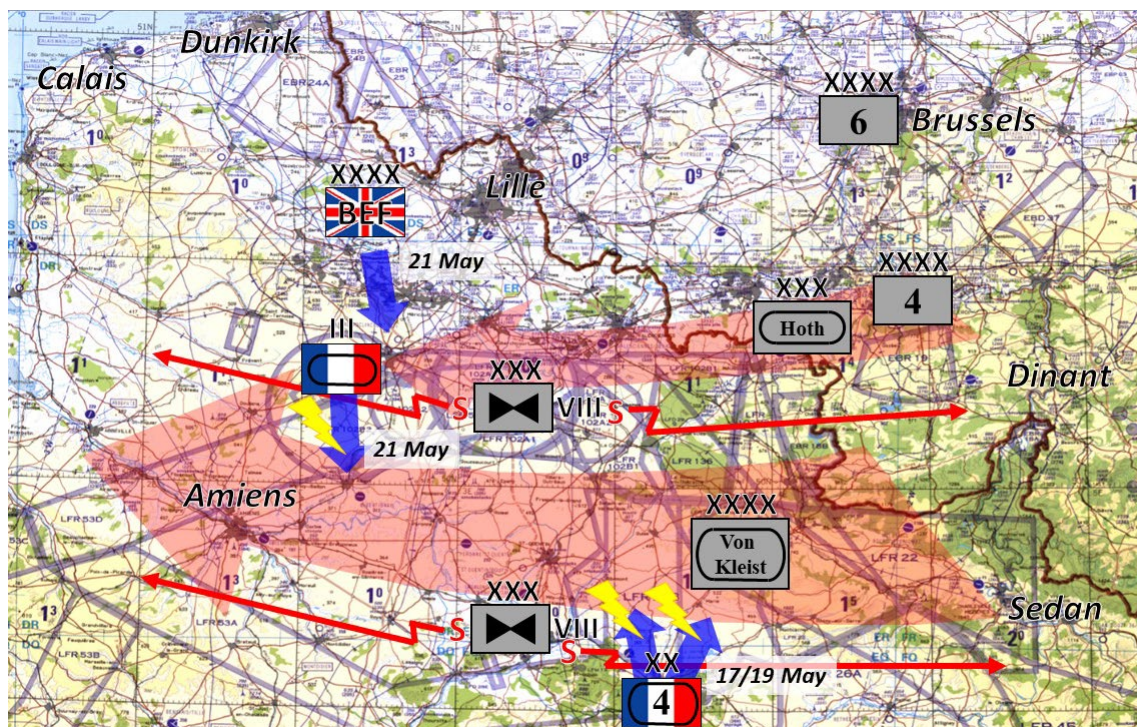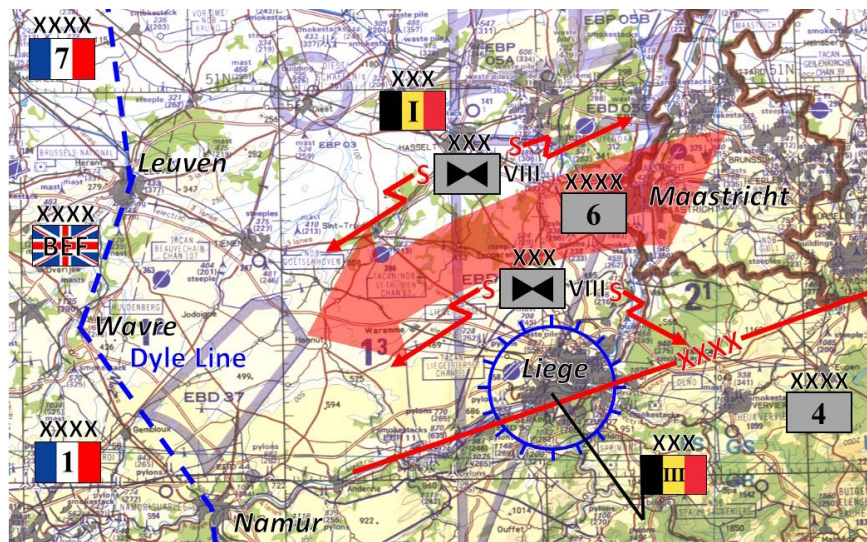
Figure 4.   VIII Air Corps Screening Panzergroup von Kleist Advance through France

Source: Created by author.

Concentrated aerial attacks further allowed the Germans to maintain the initiative and tempo by enabling breakthroughs of Allied defensive lines. This occurred on two occasions. The first was the German penetration of the Belgian frontier fortifications. The Luftwaffe Special Mission Air Corps 2 together with the Air Landing Corps—another Luftwaffe formation—conducted the famed assault which neutralized the major Belgian works at Eben Emael as well as capturing several key river crossings in Belgium and the Netherlands.[24] These successes immeasurably improved the tempo of the German offensive with significant impacts on the Allied abilities to respond to German moves.[25] The second instance of airpower enabling a breakthrough of a defensive line occurred between 13 and 15 May at Sedan, and was perhaps the decisive operation of the entire campaign.

The Meuse River represented the key to the Dyle Line, the Allied effort to create a defensive line that tied in with the Maginot Line and prevented a German attack through Belgium akin to the 1914 offensive. The three German panzer corps all attempted to force the Meuse on 12 or 13 May. Rommel's 7th Panzer Division was successful at Dinant, but this crossing was very close to the bulk of French and British forces, especially armored forces, preparing the Dyle Line. Other attempts further south along the river were unsuccessful.[26] Guderian's XIX Panzer Corps, however, conducted extensive planning with Bruno Lörzer, commander of II Air Corps.[27] Additionally, on his own initiative, von Richtofen coordinated with both Lörzer and Panzergroup von Kleist to support the Meuse crossings.[28]

The XIX Panzer Corps attacks on 13 May were successful in establishing bridgeheads on the south bank of the river. A large portion of Third Air Fleet as well

some units from VIII Air Corps maintained constant pressure on the French secondary

defenses, artillery, and reserves effectively neutralizing French firepower and isolating

the battlefield.[29] Guderian wrote that "the French artillery was almost paralyzed by the

unceasing threat of attack by Stukas and bombers" and that the air support "contributed

so markedly to [German] success."[30] The effects created by the Luftwaffe enabled the

German Army to keep the initiative, blunting the allies' abilities to hold a defensive line.
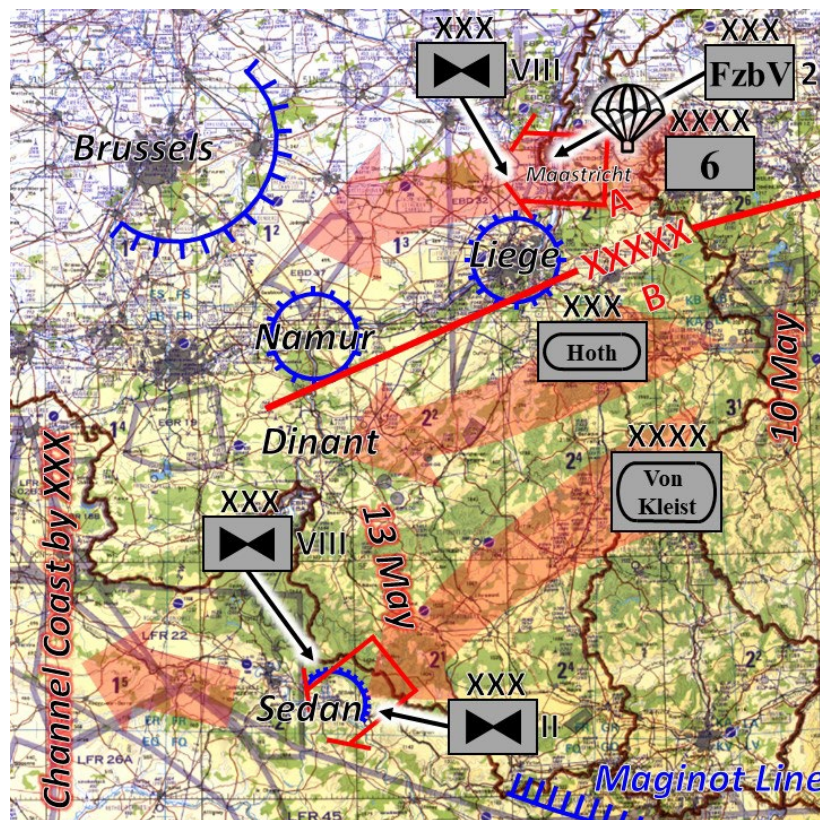
Figure 5.   Luftwaffe Operations Enabling Defensive Line
Breaches – Belgian Border and Meuse

Source: Created by author.

The third significant impact German airpower made on the overall success of the campaign accounted for the bulk of German bombing missions—interdiction of reserves isolated the battlespace. While Luftwaffe bombers exerted some effort in degrading and destroying allied air bases, the air fleets apportioned the preponderance of their bombing efforts towards interdiction as the campaign wore on.[31] These interdiction missions slowed the tempo of allied forces, inhibiting their ability to resist the German land forces. For example, interdiction prevented the French from reinforcing the Sedan sector with three divisions (ordered on 11 May) prior to the XIX Panzer Corps attack.[32] In another example, a British officer recorded being attacked from the air at least five times on 19 May.[33] On 20 May, Guderian feared a counterattack by a French reserve army of eight divisions that never materialized thanks somewhat to interdiction.[34] Interdiction certainly did not win the campaign, but it weighted the conditions drastically in favor of the Germans by inhibiting French operational maneuver once the plan to hold the Dyle Line proved untenable.

Operation Yellow supplies a stark illustration of the importance of freedom of action, initiative, and tempo in warfare. The highly centralized and rigid French methodical battle doctrine, designed to dominate a World War I battlefield, was paralyzed by rapid German action.[35] The German process of integration between the Luftwaffe and Army was modified in only a few regards prior to the German invasion of the Soviet Union in June 1941.

<u>The Offensives in the Soviet Union, June 1941-July 1943</u>

Campaign Synopsis

German operations in the Soviet Union between 1941 and 1943 can be broadly defined by three offensives. During 1941, the Germans advanced along the entire front in an effort to annihilate the Red Army.[36] The German military intended to execute its highly refined, high-tempo air-land *blitzkrieg* to remove the Red Army as an effective force. As is well known, this initial offensive was extremely costly to the Soviet Union but unsuccessful in knocking them out of the war. In 1942, the Germans placed their focus along the southern axis in an attempt to control the important economic regions along the Volga River and the oil fields of the Caucasus.[37] By June 1943, the German army was so reduced relative to previous years that the only major offensive planned was to reduce the Kursk salient.[38] The majority of Luftwaffe operations along the Eastern Front were in support of the Army.[39]

The German Army invaded with its forces organized into three army groups— North, Center, and South.[40] These three groups remained throughout the 1941 to 1943 period, although Army Groups A and B were added in 1942.[41] First, Second, and Fourth Air Fleets aligned with each of the three original army groups respectively.[42] The Germans suffered from a significant numerical inferiority in the air (see Table 2 below). Additionally, the vast distances of the USSR inhibited the Luftwaffe from concentrating its forces. A variety of doctrinal, organizational, technological, and training issues, however, made the Soviet Air Force (VVS, *Voenno-Vozdushniie Sili*) into something of a paper tiger.[43] These factors meant that the Luftwaffe was not able to establish sustained

air superiority over the USSR—in addition to the land domain, the air domain was contested to one degree or another throughout the war.

Table 2.		Comparative Aircraft Stregths, Eastern Front, 22 June 1941				
Air Fleets (Army Grp)	**Fighters**	**Bombers**	**Ratio**	**Bombers****	**Fighters**	**Fronts** (Mil. Districts)
1 (North)	110	270	1:3 bombers; 1:13.4 fighters	382	857	Northern (Leningrad)
				518	621	Northwestern (Baltic)
2 (Center)	330	550*	1:1.4 bombers; 1:2.6 fighters	765	870	West (Western)
4 (South)	210	360	1:2.4 bombers; 1:9 fighters	596	1238	Southwestern (Kiev)
				268	640	Southern (Odessa)
* This total includes 250 dive-bombers and 60 close support planes. ** These totals includes close support planes.						

Sources: Hermann Plocher, *The German Air Force versus Russia, 1941*, edited by Harry R. Fletcher, USAF Historical Series No. 154 (Maxwell AFB, AL: Air Force Historical Research Agency, 1965), 33-34, https://www. afhra.af.mil/Information/Studies/ Numbered-USAF-Historical-Studies-151-200/; Soviet Defense Ministry, *The Soviet Air Force in World War II*, trans. Leland Fetzer, ed. Ray Wagner (Garden City, NY: Doubleday & Company, 1973), 28; James Sterrett, *Soviet Air Force Theory, 1918-1945* (New York, NY: Routledge, 2013), 87.

Initially, Luftwaffe apportionment prioritized air superiority over army support.[44] Within a week the Luftwaffe thoroughly decimated the VVS, destroying more than 2,000 aircraft.[45] As a result, the Luftwaffe reapportioned its weight of effort towards interdiction and close support.

Despite the virtual elimination of the VVS as an effective opponent in the skies of Russia in June 1941, the battlespace was still highly contested. While determining the exact source of losses can be difficult, one can reasonably assume that the majority of

German combat losses due to enemy action in the period from June to early fall 1941 were likely due to ADA as opposed to enemy fighters. Given this assumption, a look at loss rates between 22 June and 1 November 1941 convinces one that despite a credible, persistent fighter threat the airspace over Eastern Front battlespaces was highly contested. Over that four-month period when the VVS was at its weakest, the Luftwaffe lost an average of 741 aircraft a month out of only 2,462 total planes—30% monthly attrition![46] As the war went on, VVS capabilities developed leading to an even higher level of contestation. During the opening months of the war, however, the Luftwaffe was able to focus efforts on army support.

During summer and fall 1941, Luftwaffe and German army operations reflected the same techniques refined in Poland and France. Air forces shaped the battlespace through AI focusing on lines of communication and screened exposed flanks. In the opening campaigns, the Germans elected to move their armored forces as quickly as possible. In some situations, the Luftwaffe screened not just a flank but even sometimes a formation's rear. V Air Corps secured First Panzer Group's rear during its advance to Kiev since the German Army fully expected the armor and motorized formations to outrun the infantry divisions, as observed in France.[47] These same units demonstrated again the effects massed airpower could bring against a fortified line as they broke through the Stalin Line on 6 July.[48]

The Second Air Fleet, supporting Army Group Center's main effort, was the strongest air fleet in the east in June 1941, "commensurate with the principle of concentrating forces at key points."[49] During the first few days of the invasion, in addition to conducting counterair operations, the air fleet provided more of the same

contributions already noted—screening and massing fires to break through defensive lines. Notable examples include II Air Corps' neutralization of the Brest citadel to cover the Second Panzer Group's crossing of the Bug River.[50] The commander of Panzer Group 3, Hermann Hoth, cites the activities of VIII Air Corps as allowing a "surprisingly quick" crossing of the Western Dvina on 2 July.[51] On 24 June, strong Soviet armored forces attacked the German Ninth Army near Grodno, and the entire VIII Air Corps committed to the attack, neutralizing 105 tanks.[52] While the combination of airpower and armored forces produced prodigious results similar to those obtained in France, including massive encirclements at Kiev and Smolensk amongst others, the Germans culminated short of Moscow and transitioned to the defense through the winter of 1941-1942.

Soviet counteroffensives during the first winter in the east pushed the Germans back but subsided by April 1942.[53] While the Germans attempted to hold their ground, they simultaneously planned for Operation Blue (*Blau*)—a phased strategic plan that began by capturing the Caucasus.[54] As shaping operations for Operation Blue, Army Group South and Fourth Air Fleet initially focused on retaking the Kerch peninsula as well as subduing Sevastopol.[55]

Crimean operations provided another example of airpower enabling a breakthrough of a fortified zone. Massed airpower from VIII Air Corps set conditions for Eleventh Army units to penetrate the twelve-mile thick Parpach Line.[56] The field army and air corps then turned their attention to Sevastopol. Massing significant airpower against the fortified port, the Germans took Sevastopol in one month of heavy fighting.[57] Figure 6 below highlights how airpower was treated as a maneuver force during this

campaign. With the southern rear area secured, the Luftwaffe repositioned forces north for Operation Blue.
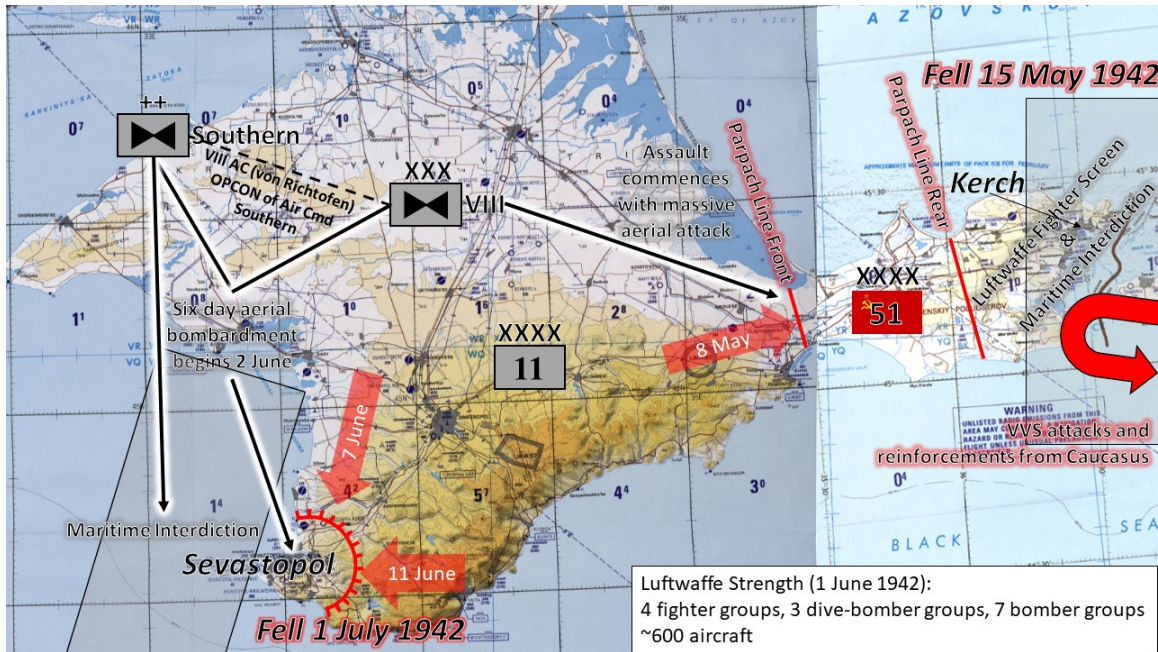
Figure 6.   German Operations in the Crimea, May-June 1942

Source: Created by author.

In preparation for Blue, Army Group South received priority for replacement men and equipment and was reinforced by units from the other army groups.[58] VIII Air Corps, the premier Luftwaffe close support unit, moved south to support the offensive.[59] Fourth Air Fleet, acting as a maneuver force, began the campaign with an emphasis on cutting the rail lines across the Don River (the left flank of the offensive).[60] Blue began on 28 June 1942.[61] As in 1941, the Germans enjoyed initial successes and advanced rapidly. Interdiction was highly effective, disrupting Soviet supplies and occasionally causing significant damage to Red Army formations.[62]

As the two main axes of advance diverged—one heading southeast towards Baku and the other east towards Stalingrad—the air units were hard-pressed to constantly shift their bases to support one spearhead or the other. This led to the creation of Tactical Air Command North (*Luftwaffen-Gefechtsverband Nord*), essentially the creation of an additional close support air corps.[63] These tactical air commands became commonplace throughout the Luftwaffe over the next year. These organizations as well as Close Support Leaders (*Nahkampfführer*) were responsible for maintaining close coordination between the air corps and field armies.[64] Operation Blue ground to a halt in the outskirts of Stalingrad and, after the disastrous results of the 1942-1943 winter, the Germans prepared their last major offensive gasp in the Soviet Union at Kursk in the summer of 1943.

Fifty divisions, including nineteen panzer and motorized formations, with 2,700 tanks and assault guns attacked both shoulders of the Kursk salient as part of Operation Citadel (*Zitadelle*) on 5 June 1943.[65] The Luftwaffe supported the operation with VIII Air Corps (part of Fourth Air Fleet) in the south, aiding Fourth Panzer Army and Army Force Kemp. In the north, 1st Air Division (part of the newly-constituted Sixth Air Fleet) supported Ninth Army.[66] Potent Soviet defenses, enabled by a complete lack of German operational surprise, awaited the German offensive.

The ground attack was slow and seemed unable to break through the layered Soviet defenses.[67] By 14 July, the Ninth Army began withdrawing followed by the Fourth Panzer Army on 18 July.[68] The Luftwaffe was unable to mass enough power to rupture the Red Army's defensive lines, demonstrated by the uncharacteristically slow

advance of German armor during the initial phase. However, the Luftwaffe provided valuable screening effects akin to previous operations.

Elements of VIII Air Corps showed once again the value of airpower as a maneuver force enabling land operations on 8 July 1943 near Belgorod. On that day, one ground-attack group (IV/SG 9) turned back a Red Army attack by both the 2nd and 5th Guards Tank Corps using airpower alone.[69] This attack would have slammed into the right flank of II SS Panzer Corps if VIII Air Corps did not supply an effective screen. The Soviet official history did not admit to specific losses but does note that German aircraft defeated the tank attack.[70] Figure 7 below details this action
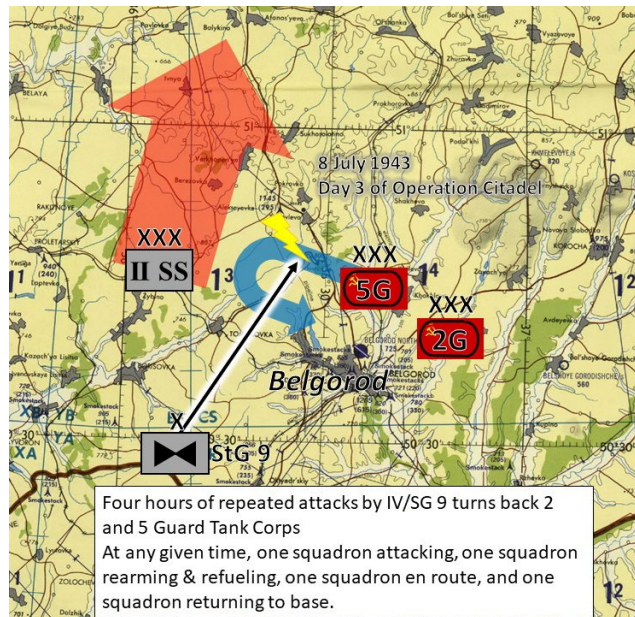
Figure 7.   IV/SG 9 Halts the Attack of the Soviet 2nd and 5th Guards Tank Corps

Source: Created by author.

Just a few days later, the Luftwaffe again provided vital screening effects for German land forces. A Red Army attack ruptured the German lines near Orel and threatened to cut the Bryansk-Orel railroad. On 17 July 1943, the German 1st Air Division, repositioned north from Kursk, turned back the Red Army's 1st Tank Corps northwest of Orel.[71] Once again, the Soviets did not state their losses but did admit that the tank corps withdrew to woods in the north to wait for reinforcement by reserves.[72] The Luftwaffe effects allowed German army forces in the area to re-establish their defensive lines in the area.[73]

Figure 8.   1st Air Division Defeats Attack by 1st Tank Corps Near Orel, 17 July 1943

Source: Created by author.

Despite successful disruption operations like the two described above, Luftwaffe operations were significantly restricted during Citadel and the surrounding operations compared to previous offensives. The German emphasis on close support coupled with decreased aircraft strength and an increasingly potent VVS minimized interdiction efforts.[74] This lack of interdiction essentially meant that the Germans granted the Soviet Union forces safe passage anywhere more beyond the belt of territory near the front lines. This was the first major German offensive in which deep interdiction did not play a major role and the effects are readily apparent—the Red Army shifted forces throughout the battlespace at will, ultimately crushing the last major German offensive in the east.

Effectiveness

The German campaigns in the Soviet Union were effective at first but suffered in 1943 due to a dearth of resources and a strengthening VVS. Like Operation Yellow, the campaigns in the Soviet Union demonstrated the importance of aviation as a screening or disruption force. In contrast to the successes of 1941 and 1942, though, operations in the summer of 1943 demonstrated the dangers of airpower ceding the enemy's rear area and focusing exclusively on close support.

The latter point is worthy of closer examination. Based on previous offensives, a valid assumption is that the Germans desired to isolate the Kursk salient through a sustained and pervasive interdiction campaign well behind the lines. However, as compared to previous campaigns, the Luftwaffe simply did not possess the strength to delve into the Soviet rear. The OKL apportionment—presumably pressured by Army High Command (OKH, *Oberkommando des Heeres*) and the Armed Forces High Command (OKW, *Oberkommando der Wehrmacht*)—heavily prioritized close support.

As a result, German preparatory air attacks focused exclusively in the area within the salient and along the defensive lines.[75] This focus on the German close area effectively ceded the Red Army's rear area, allowing them complete freedom of movement behind their lines. The Red Army, unused to this level of freedom, used it to mass prodigious forces in the salient.[76] Despite significant amount of close air support, the Germans were unable to contend with the massive forces and fortifications the Soviet Union was able to mass. The modest gains made by the Germans were quickly eliminated by Soviet counterattacks.

<u>Command and Control System</u>

The German military command and control structure made each service highly independent of one another. The only entity within the Luftwaffe chain of command, to include airborne ground troops, which answered to a non- Luftwaffe entity was the OKL. Joint planning occurred at the highest levels and any disagreements between the army and Luftwaffe at the lower levels were either solved by coordination between the OKH and OKL or by the OKW.[77] In most cases, OKL established the apportionment priorities for the air fleets.[78] Despite the destruction of most Luftwaffe records during the war, given the German predilection for mission command as well as corroborative statements by the various authors of the USAF Historical Studies, one can surmise the concepts of authorities within the Luftwaffe operational C2 framework.

Air fleets were associated with army groups. During Operation Yellow, Second Air Fleet operated in conjunction with Army Group B while Third Air Fleet integrated with Army Group A (See Figure 9). Air fleets attempted to maintain headquarters co-located with their army group counterparts. When this was impossible for logistical

reasons, the air fleet assigned a liaison team, usually under a Luftwaffe General Staff officer, to the army group headquarters.[79] OKL assigned AOs to the air fleets. Air fleet headquarters handled all Luftwaffe operations within their AO.[80] OKL generally provided broad strategic guidance and air fleets then turned that guidance into specific strategic lines of effort and operational missions for each day. Put into current USJF Air Component C2 terms, OKL produced the Joint Air Operations Plan and air fleets produced the Air Operations Directive as well as supplied a Joint Integrated Prioritized Target List and some general guidance to subordinate units.

Air corps executed the air fleet missions. Air corps varied wildly in composition (based upon their mission) but typically consisted of several groups each of bombers and fighters as well as ancillary aircraft. As a result of the composite force structure, the air corps operated as a self-contained unit, responsible for accomplishing all mission types within its AO. Air corps received an AO within the air fleet's AO, similar to subordinate units in ground formations.[81] The author's perception, predominantly based on the various USAF Historical Studies, is that the air corps generally issued tactical objectives to subordinate units on a daily basis but left the specifics of how to achieve those objectives to lower level planning at the wing or group. In the case of a large mission, the air corps operational staff planned the entire mission. However, in most situations, an air corps ordered a unit to interdict a stretch of railroad between town A and town B in the morning then attack an airfield in the afternoon. The wing and group commanders determined the tactics and often the precise targets to strike.[82] In the case of interdiction and even close support, typically airborne unit commanders selected targets based on guidance either from their own commanders or from the air support request.[83]

As a comparison to modern USJF systems, OKW and OKL set the air apportionment and prioritized missions for the Luftwaffe as a whole. The air fleets further refined the apportionment, essentially by assigning air corps to specific lines of effort. The air fleet could, if necessary, mass its corps at specific objectives when needed—the corps missions could change daily.

Air corps managed their AO by assigning missions to specific wings and groups. Air corps also facilitated the coordination of enabling effects. For example, the air corps might order a bomber unit to strike a target at 0900, but the air corps also ordered a fighter group to send an appropriate escort force to rendezvous with the bombers at a designated time and place. Air corps orders typically included target information, strike time, escort rendezvous information, and updates on the ground and air situation.[84] The various wings and groups planned and executed the assigned missions. In most cases, wing, group, and sometimes even squadron commanders held allocation authority.[85] Group and lower tactical commanders launched sorties as they deemed necessary to accomplish their objectives.

Army group and air fleet leaders coordinated to manage interdiction. Often, assuming sufficient forces were available, the air fleet commander then assigned the AI missions to one of his air corps while assigning a different air corps to the close support mission.[86] See Appendix A for examples of higher headquarters orders.

Close support was affected through a system of liaisons. Air units attached air liaison officers (*Fliegersverbindungs Offizier*, or *Flivos*) at levels down to corps. In some cases, *Flivos* were attached to divisions as well.[87] Based on lessons learned during the Polish campaign, the VIII Air Corps attached Luftwaffe signals detachments (*Nachrichts-*

verbindungstruppe) to armored division command posts during the French offensive to feed information to the air corps. Of note, these officers were not authorized to request air support or advise the army commanders. Their sole purpose was to keep the air corps headquarters appraised of the ground situation so the air corps leadership could make informed decisions about the employment of air forces.[88]

During the offensives in the Soviet Union, the frontage assigned to air corps sometimes became too large for a single headquarters to keep in contact with the supported army headquarters. The Germans created the Close Support Leader and, in some situations, created air corps equivalent units called Tactical Air Commands. These elements remained with or near the supported army headquarters.[89] The Close Support Leader received information directly from the liaison elements at army divisions and corps.[90] Typically this person had the authority to allocate close support sorties and assign missions to wings or groups.[91]

The German C2 system was one in which control was highly centralized, but not completely centralized. Each layer of command—OKL, the air fleet, and the air corps—possessed some of the guidance and apportionment authorities encapsulated in a modern USJF Air Operations Center (AOC). Of note, allocation was conducted predominantly at the air corps and, to a lesser degree, at echelons below the wing. Execution was highly decentralized. Air corps provided some execution capabilities, but the majority of execution was conducted at the group and lower levels. This included the ability for wing and group commanders to make decisions regarding allocation. Figure X below illustrates the C2 construct. A tactical system of liaisons and controllers functioned within the lower echelons and beneath this structure.
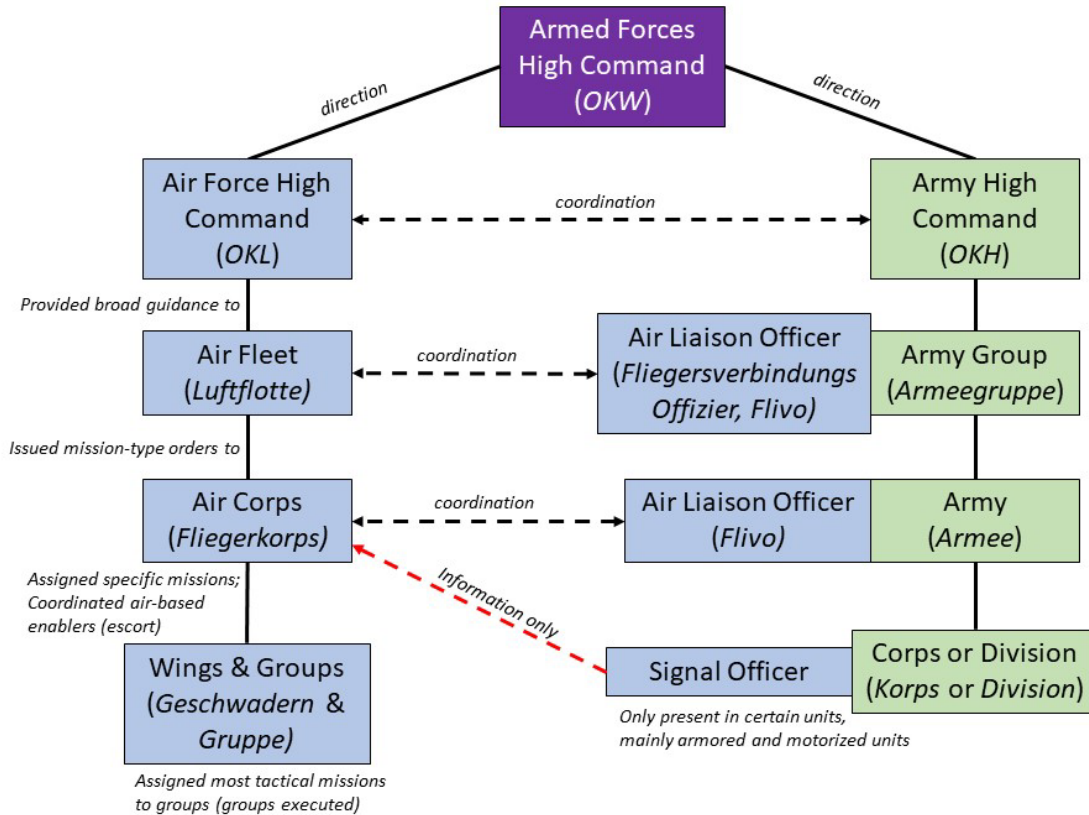
Figure 9.   German Operational Command and Control Structure

Source: Created by author.

German tactical command and control was minimal, although there were improvements during each operation. The prevalent theme of German tactical C2 from an air-ground perspective was to inform the Luftwaffe of the situation and, in some situations, designate priority targets but neither to command actions nor control strikes from the ground. Von Richtofen experimented with CAS procedures in May 1939, but the results did not warrant employment until the invasion of the Soviet Union.[92]

In Poland, von Richtofen fielded four Air Signal Detachments (*Luftnachrichten-verindung*) with various armored divisions. Two of the four teams used armored cars and

radios.[93] The Germans trained substantially more teams for the French campaign.[94] In both the Polish and French operations, the role of these liaisons was to keep the von Richtofen's headquarters appraised of the ground situation.[95] The air corps staff used this information to develop tactical plans and disseminate orders to wings and groups. Von Richtofen felt this system worked well if there was a day to plan but broke down when operating at a faster tempo.[96] Due to this poor level of timely coordination regarding close support, risk mitigation was a significant problem for the Germans.

During the Polish campaign, there were no significant risk mitigation techniques in use by the German military. This resulted in a number of fratricides. The German 10th Panzer Division noted in its after-action report repeated attacks by German aircraft, inducing the report to express distrust in the Luftwaffe.[97] The Germans attempted to use "rearward bomb lines" in France—lines beyond which the Luftwaffe had free rein—but this was only marginally effective.[98] Often ground troops maneuvered past the lines well before the expiration of the line.[99] In Russia, the Germans built upon the liaison detachment system with special forward air control detachments intended to mitigate risk as well as provide better targeting information during close support missions.

The forward air detachments control (*Leit-Trupp*) controlled what the USJF would today term CAS. They were identified variously as dive-bomber, close support, or fighter *Leit-Trupp* depending on what specialty the leading *Flivo* was intended to control (*Stukaflieger-Leit-Trupp, Schlachtflieger-Leit-Trupp, Jagdflieger-Leit-Trupp*). These detachments operated near the front line and possessed the necessary equipment to communicate directly with aircraft.[100] These detachments received pertinent information on friendly disposition, artillery, and targets from the liaison elements at the division then

provided terminal attack control—or at least target correlation—for the German aircraft once they arrived on station. The *Leit-Truppen* typically only closely controlled strikes when the targets were near friendly forces. In most situations, the inference is that air units executed the same methods in use since 1939—the air mission leader selected targets from his cockpit.

In short, prior to 1941, airborne mission commanders had the authority to nominate and strike targets. Once planes left their airfields, there was only marginal ability for headquarters to send those aircraft to different targets or tasks. While armies and air corps sometimes established rearward bomb lines—akin to a modern Fire Support Coordination Line (FSCL)—the aircrew decided whether or not to strike a given target. After 1941, this remained largely the case unless aircraft were executing close support missions in the zone of a division with an attached forward air control detachment. In that case, the detachment controlled strikes. The German tactical C2 system, illustrated in Figure 10, resembles the current USJF model in many respects.
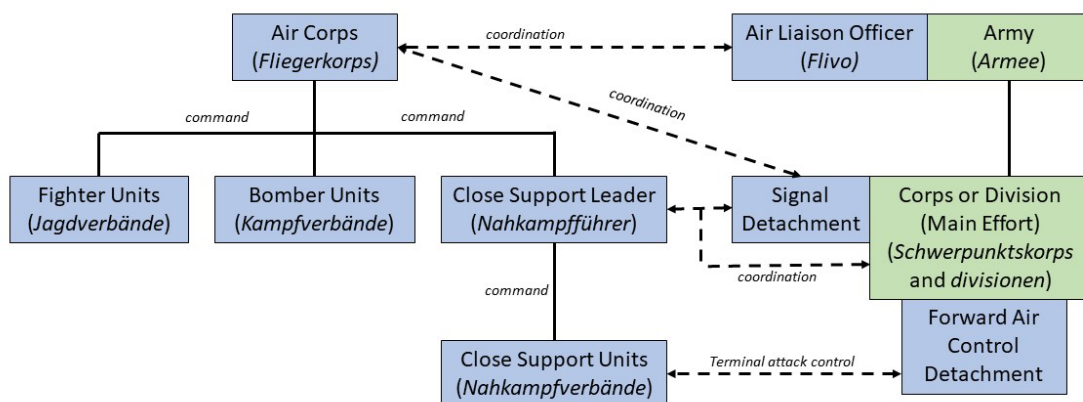
Figure 10. German Tactical Command Control Structure

Source: Created by author.

Analysis of the German System

The German system from 1940 to 1943 epitomized the original Prussian concept of *Auftragstaktik*. The German military during World War II viewed *Auftragstaktik* as essential to leadership and can be encapsulated into a relatively simple concept: Make decisions based on the mission (the designated objective to achieve) and the situation (usually uncertain).[101] The Germans developed their system to provide maximum freedom of action for both the land forces and air forces. This freedom fostered an environment in which encouraged initiative, enabled cross-domain synergy, and led to a tempo that far exceeded its adversaries, until those adversaries began to adapt in 1941. Four observations lead to this conclusion. First, the leaders of the air and land services understood common objectives during each campaign. Second, those leaders trusted one another to work towards those goals (as opposed to focusing on divergent efforts). Third, the Germans viewed airpower as a maneuver force. Finally, the C2 structure allowed for effective integration between the air and land forces without inhibiting the freedom of action of either service.

At the operational and tactical levels, joint objectives were established and communicated throughout the applicable air and land headquarters for each campaign. Most orders were mission-type orders for both air and land forces (see Appendix A for mission-type air orders). High command coordination ensured that the large units—army groups and air fleets—remained synchronized. Simultaneously, the flexible apportionment authority inherent in the German system allowed subordinate units like armies and air corps to establish more immediate joint objectives to work towards. The

planning for the Sedan Meuse crossings were indicative of this process. Trust between leaders played a large role in facilitating this coordination.

During the French campaign, the air and land maneuver was well-integrated at the operational and tactical levels not due to any systemic processes, but due to the personal relationships and professionalism of the army and Luftwaffe officers. The German air-ground integration techniques peaked during the eastern offensives of 1941 and 1942. During these campaigns, the Luftwaffe and army were able to implement systems and processes honed during the first two years of conflict.[102]

Continuing with the Meuse example, Guderian, Lörzer, and von Richtofen planned the massive air support for the XIX Panzer Corps' crossing via personal interactions rather than a codified process. In fact, Sedan was not even within Richtofen's air corps AO, but he sent planes to support based simply on the planning conducted between these three men and their staffs.[103] Many other cases in the early campaigns suggest that these relationships played an integral role in establishing trust between the two services and thereby integrating air and land maneuver.

Trust and common objectives created a mindset within German leaders that airpower was a maneuver force. This perception, coupled with *Auftragstaktik*, meant that the Germans naturally provided as much freedom of action as possible to their air forces, thereby enabling initiative and establishing tempo as discussed in Chapter 1. Examples at multiple command levels exemplify this notion.

At the higher levels (air fleets and army groups), objectives were provided by OKW and the air and ground leaders were expected to create their own sub-objectives as equals. Air fleets remained independent of army groups. Similar interactions occurred at

the army-air corps level. In both cases, the Luftwaffe and army leaders spoke in terms of effects, or missions, rather than specific targets (again, see Appendix A). At lower levels, air unit commanders were able to execute their missions without restrictive control measures or procedures in place. Admittedly, there was too much freedom for the Luftwaffe resulting in numerous fratricides, especially in Poland and France. However, the improved liaison elements in addition to the radio-equipped *Leit-Truppen* deployed in the Soviet Union significantly reduced this risk. These liaison elements were part of a C2 structure that consistently sought to enable initiative.

The German command and control system enabled initiative at all levels. Linking command structures only at the highest levels meant that each service was able to run as best as it saw fit. Despite lacking formal coordination mechanisms, the system worked based on the personal relationships between air and land leaders as well as the emphasis on initiative. Luftwaffe unit commanders enjoyed significant autonomy, including authorities for force packaging and sortie allocation down to the air corps and lower levels. Group and squadron leaders enjoyed a significant level of autonomy as compared to commensurate commanders in the 21st Century USJF.

Ultimately, the German system provided significant German advantages in the integration of air and land maneuver and operational tempo but primarily via personal relationships as opposed to doctrinal solutions. The USJF should look at ways to emulate the German relationships between air and ground leaders to create the trust. Trust between services is vital for land forces to perceive air forces as maneuver elements. Considering airpower a maneuver force is essential to creating a C2 structure and

permissive risk mitigation procedures which provide freedom of action and enable

initiative. See Table 3 below for a summary of the German system.

Table 3. Summary of the German System
German Principles
- Success of the joint force is vital to overall success in warfare   - Defeating the enemy's fielded forces (primarily the army) achieves victory   - Maximize freedom of action in both air and land domains to establish tempo   - Freedom of action in the air gained by: - Strict independence of air forces from army chain of command   - Army requesting effects, not proscribing methods   - Indirect support (AI) is preferable to direct support (CAS)

Pros	Cons
- Strong relationships between leaders and staffs created good integration between air and land maneuver - Near complete freedom of action in both air and land domains - Very rapid tempo	- Emphasis on independence made effective staff integration heavily reliant on personalities - Insufficient risk mitigation procedures - Primacy of army objectives over other considerations inhibited lines of effort excluding army support such as strategic attack and even sometimes air superiority later in the war

Analysis
- Established common joint objectives for each operation   - Trust, often based on personal interactions and relationships, between air and ground leaders   - Airpower viewed as a maneuver force   - C2 structures based on the above enabled initiative within air domain   - Permissive control measures generated tempos but required appropriate risk mitigation to minimize the possibility of fratricide

Source: Created by author.

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CHAPTER 3

WORLD WAR II – THE RED ARMY AND ITS AIR FORCE, 1942 TO 1945

In 1940, less than six months before Germany invaded, the Soviet Union won a humiliating "victory" over the Finns, demonstrating a level of military impotence difficult to imagine given the huge numbers of the Red Army. The crushing German defeats of 1941 and summer 1942 further presented an appearance of military ineptitude. However, by 1945 the Red Army was the largest army in the world with leaders, men, equipment, and doctrine well-honed for large-scale combat operations. The VVS, virtually annihilated in 1941, executed air operations in 1945 on par with any of the other major states fighting in the war.[1] While largely eschewing strategic attack and interdiction, the Red Army and the VVS developed a potent combined arms system that massed effects from air and land forces at decisive points to punch through German defenses and exploit successes.

Throughout the background discussion that follows, take note of several themes that are discussed in detail at the end of the chapter. First, the Red Army and VVS consistently worked towards the commonly understood objectives. Second, the command and control system developed between 1941 and 1943 was a major reason for the effective Red Army combined arms team. Finally, airpower served a significant role in enabling land maneuver especially in 1943 and later.

Background

Interwar Period and Doctrine

The Soviet Union emerged from the Russian Civil War with a vision of military operations rather distinct from most other states. The Red Army's belief emphasized

large-scale exploitation of breakthroughs not necessarily to destroy an enemy force, but to disintegrate it. Thinkers such as Svechin, Tukhachevskii, Triandafillov, and Isserson, amongst others, developed the notions of deep operations (*glubokiye operatsii*) and deep battle (*glubokiye boi*) to achieve this end. This theory of operational art underpinned the VVS development prior to Barbarossa in 1941.

The Red Army developed deep operations as a method to solve the expected nature of future conflicts, namely that warfare generally follows a sequence of "overcoming [initial] resistance, the development of maneuver into the depths; and confronting new resistance within the depths."[2] To overcome this issue, the Red Army designed a combat system intended to attack an enemy in depth as well as deploy echeloned forces to break through enemy defenses and exploit the enemy's rear.[3] See Figure 11 below illustrating this concept.
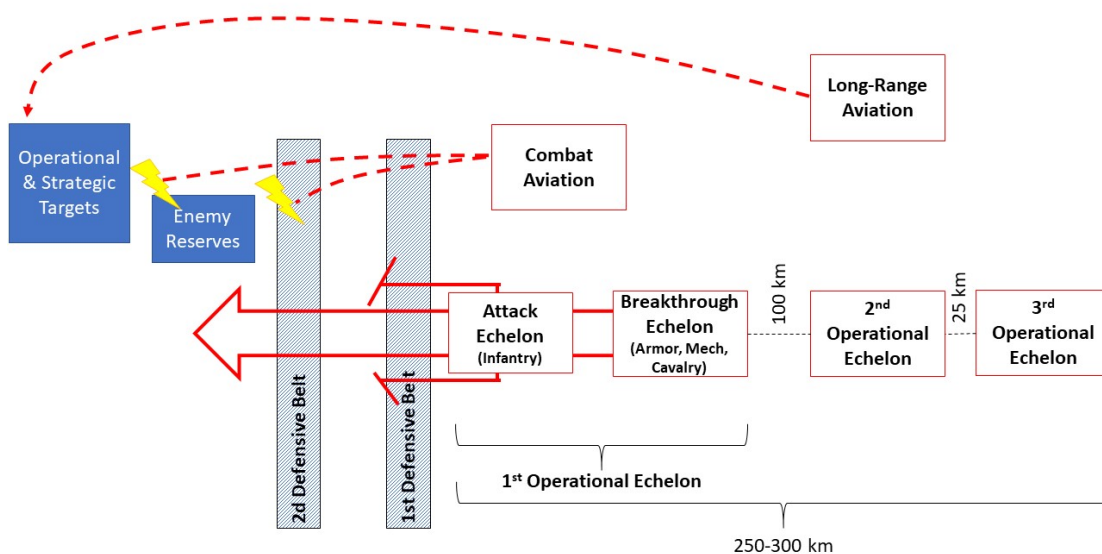
Figure 11. Isserson's Entry in Depth and Deep Operations

Source: Created by author.

In 1936, the Red Army published Temporary Field Regulations 36 (*Vremennoi polevoi ustav RKKA* 1936, PU-36), a capstone document that established deep operations within Red Army doctrine.[4] PU-36 defined aviation as engaging in both "independent operations" as well as maneuvering in close concert with land forces at both the operational and tactical levels.[5] The Red Army organized the VVS to fulfill this concept.

In June 1941, the VVS comprised five separate components, predominantly based on providing capabilities to land and naval commanders to conduct deep operations and deep battle. Stavka directly controlled the Long-Range Air Force. Each military district—the peacetime equivalent of a front or army group—directed an air force equipped to conduct attacks against operational targets organized into fighter and bomber divisions. Some field armies had smaller composite divisions including fighters, bombers, and attack aircraft intended to provide close support. Most army corps also had liaison squadrons assigned to them. The Naval Air Service also answered to the VVS and formed its fifth component.[6]

Red Army staff officers recognized issues with this model before the war. Its main failing lay in the highly decentralized command structure which prevented the massing of airpower, a problem seen during large-scale war games in 1936.[7] Despite these issues, continuous small wars and the Stalinist purges in the late 1930s limited VVS leaders' ability to reform the organization prior to the German invasion.[8]

<center>Spain, Khalkin Gol, and Finland, 1936-1941</center>

The Red Army benefited from the experience of numerous small conflicts in the years leading up to World War II. While the Soviet Union sent military forces to numerous locations throughout the world, the three conflicts that played the largest role

in shaping VVS views were the Spanish Civil War, the Khalkin Gol campaign, and the Winter War against Finland.

Soviet Union involvement in the Spanish Civil War began in the fall of 1936. During that period, the Soviets began sending forces to support the Republican faction in the Spanish Civil War to "repel fascism."[9] During the early stages of the war, the Republicans enjoyed air superiority as the VVS aircraft and their pilots outclassed the older German and Nationalist air forces in terms of speed and maneuverability.[10] However, as the German Condor Legion received improved aircraft models such as the Bf 109, the airspace over Spain became neutral.[11] While the concept of deep operations as a whole was untested in Spain due to the relative dearth of Soviet ground forces and the nature of the conflict, Red Army airpower thinking was fundamentally altered by the war.

While PU-36 emphasized the importance of airpower in deep operations, many Soviet airpower theorists prior to the Spanish Civil War, including a chief of staff of the VVS General A. N. Lapchinsky, stressed the primacy of strategic bombing.[12] During and after the war, though, Lapchinsky's and other VVS leaders' analysis of the Spanish operations turned theory away from strategic bombing and towards close support. A notable event that influenced this thinking was the Battle of Guadalajara. In March 1937, VVS aircraft in close coordination with armored forces devastated an Italian motorized force northwest of Madrid.[13] The Red Army concluded that airpower played an integral role as part of a combined arms team in stopping the Italian advance.[14] Similarly to the Luftwaffe's leaders, VVS leaders recognized great benefits to close support in Spain and little gain from strategic attack.

As a result of these observations, Lapchinsky argued two main points in 1939 after his return from Spain: First, maneuver war required victory both in the air and on the ground and, second, that concentration of air forces along a given front at the appropriate time was vital to overall success.[15] Thus, a major result of the Spanish Civil War from a Soviet perspective was the alignment of VVS thinking with the Red Army's espoused PU-36 doctrine. Months after Lapchinsky published these arguments, events in the Far East reinforced his observations.

The summer 1939 Khalkin Gol incident, also known as the Nomonhan Incident, presented the Red Army an opportunity to execute deep battle. Then-Corps Commander Georgii Zhukov's forces, executing deep battle techniques, enveloped the Japanese 23d Division within three days and destroyed remaining Japanese forces in the Soviet-claimed territory within eleven days.[16] The Soviets perceived a number of flawed tactical conclusions from this battle (such as assessing that the small bomb capacity of the primary tactical bomber was sufficient, poor air combat abilities, navigation, etc.) but observed the validity of their broader operational concepts.[17] Khalkin Gol, then, reinforced the VVS' analysis of the Spanish Civil War: close support as part of deep operations should be the focus of the VVS. Incorrect tactical lessons from Mongolia coupled with purges of experienced air leaders manifested themselves in the poor VVS performance during the Winter War.

The Winter War commenced in November 1939 when the Soviet Union invaded Finland seeking territorial gains. An underperforming VVS showing in the air matched the notoriously poor Red Army performance on the ground. Despite deploying as many as 3,000 aircraft to the theater, a combination of poor coordination, weak tactical skills,

ineffectual application of lessons from previous conflicts, and the division of air units under the command of various ground formations led to practically nonexistent air effects.[18] The VVS lost as many as 900 aircraft for very little gain.[19] VVS leaders exited the war convinced that their doctrine was sound but drastic organizational and tactical reform was required.[20]

One key reform aimed to simplify offensive air forces into two groups: smaller tactical groups that remained under field armies and a larger operational force that answered to fronts. Despite this recommendation, more than 60% of frontal aviation remained under field armies in June 1941, and the practice of subordinating aviation units to armies continued into 1942. The Soviets also undertook a significant modernization and training program, resulting in production of a number of primarily fighter aircraft comparable to German models and a greatly enlarged training regimen.[21] Despite reform attempts, the Red Army was unprepared for war compared to the German armed forces in June 1941.

The Campaigns of 1941-1942

On 22 June 1941, the Germans invaded the Soviet Union along three main axes: towards Leningrad, Moscow, and into Ukraine. Figure 12 below illustrates an overview of Barbarossa as well as VVS organization in June 1941. Note that the VVS organization was still decentralized, with each ground echelon controlling its own portion of air forces.
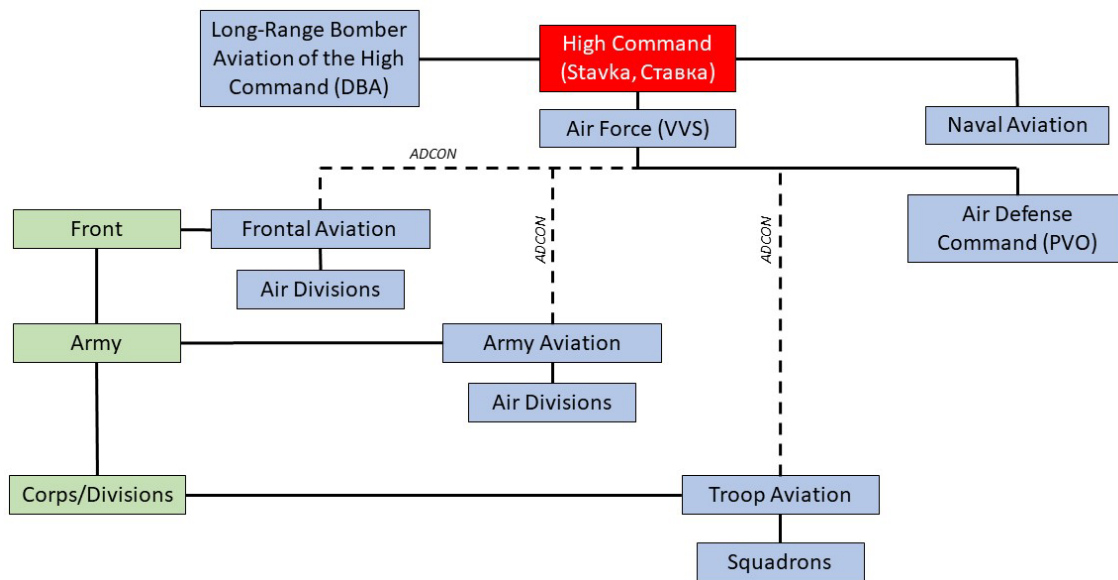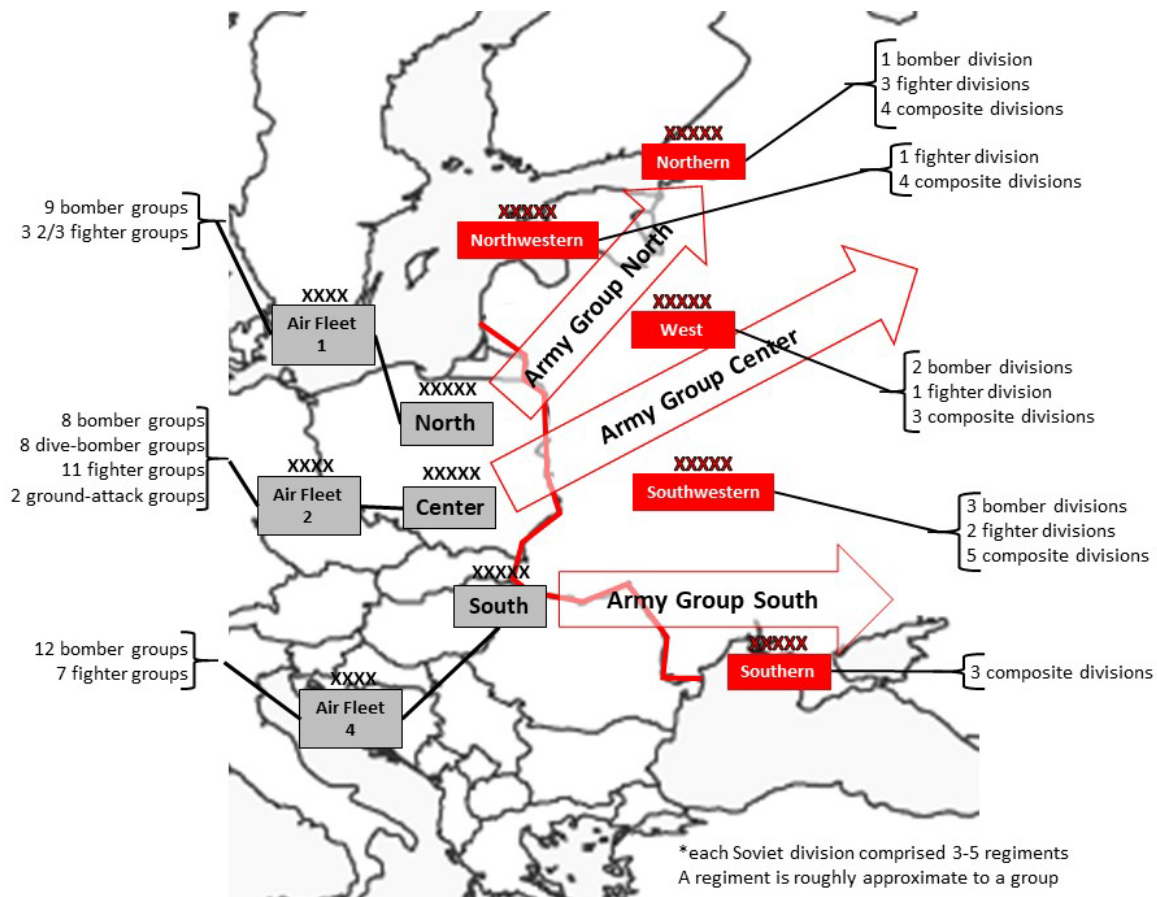
Figure 12. Barbarossa Major Axes and Strengths; VVS Organization in 1941

Source: Created by author.

During most of 1941, the Red Army and VVS resisted when able but suffered devastating losses. By October 1941, the VVS suffered 8,166 aircraft (nearly 100% of the original VVS strength!).[22] In some cases, the VVS' operations slowed, but could not halt, the German advance, notably at Kiev and Crimea.[23] The first battles that were not predominantly smashing German victories occurred in the late fall and winter of 1941 outside Leningrad and Moscow.

In early October, the German Army Group Center faced the Red Army's Western, Reserve, and Bryansk Fronts in the Mozhaisk Line defending the approaches to Moscow.[24] While the Red Army initially lost ground, freezing rains brought on the annual *rasputitsa* ("time without roads"), virtually grinding motorized movement to a halt. Simultaneously, newly organized Soviet reinforcements attacked, including with T-34 tanks which proved more than a match for German armor.[25] As winter set in, the VVS gained a decisive advantage over the Luftwaffe around Moscow.

Stavka reinforced the Western Frontal Aviation with at least four air divisions (300+ aircraft), including an air corps of the Air Defense Command (PVO, *Protivo-Vozdushnaia Oborona*) and Long-Range Bomber Aviation. In a harbringer of future organizational developments, a Stavka representative, Commissar P. S. Stepanov, coordinated all of the air units around Moscow.[26] The VVS also began installing radios both in aircraft and ground control stations throughout the area, although tactical C2 techniques were still rudimentary.[27] Regardless of these reforms, the VVS still failed to produce meaningful effects during the winter of 1941.

In early 1942, the Red Army investigated the poor performance of the VVS. A report to Stalin examining the winter offensive of 1941-1942 cited multiple issues

including poor coordination between air and land forces and the difficulty of massing airpower at decisive points based on the byzantine command structure.[28] Another report by Marshal S. K. Timoshenko in mid-1942 described how leaders were unable to coordinate the efforts of front and army aviation as well as an inability to centrally control airpower "on a scale of one or several fronts."[29] Operations around Leningrad presented the Soviets with a model for more effective C2 of their air forces.

In July 1941, Stavka established three sectors ostensibly to improve C2 of air forces. General A. A. Novikov commanded the Northwestern Sector and assumed control of the frontal aviation of the Northern and Northwestern Fronts as well as the Red Banner Baltic Fleet aviation and VII Fighter Air Corps of the Leningrad PVO.[30] Novikov provided overall direction for the entirety of air forces in the Baltic and Leningrad regions.[31] Novikov also created ten strike groups (UAG, *Udarnyye aviatsionnyye gruppy*) composed of different aircraft-type regiments.[32] While the results were admittedly insufficient to affect the land maneuver, the employment of airpower in Novikov's sector was centrally controlled and much more streamlined than in other areas. As the Soviet winter offensive culminated in spring 1942 and having bought some breathing space for themselves, Stavka looked to Novikov to reform the VVS.

Novikov took command of the VVS on 11 April 1942.[33] He immediately undertook reform and reorganization of the VVS, beginning with the VVS staff. Long-Range Bomber Aviation became Long-Range Aviation (ADD, *Aviatsii Dal'nego Deistviia*), still subordinate to Stavka. Frontal aviation commanders were designated deputy front commanders and placed on the front's military councils, making front commands more joint in nature. Front air commanders gained control of local PVO units

if needed.[34] Most importantly, though, Novikov consolidated airpower at the front level

within air armies. These armies typically consisted of fifteen or more aviation regiments

(500 to 1,000 aircraft) but the composition varied widely based upon the assigned

mission.[35] Army aviation was reduced to one composite regiment, typically

reconnaissance and liaison aircraft, with the rest of the assets moved into the air armies.[36]

Novikov also strove to create Stavka Reserve Air Corps, intended to allow strategic

reinforcement of the air armies within the front.[37] Figure 13 below illustrates the new

organization. The newly organized and slowly learning VVS began to mature around

Stalingrad in late 1942.
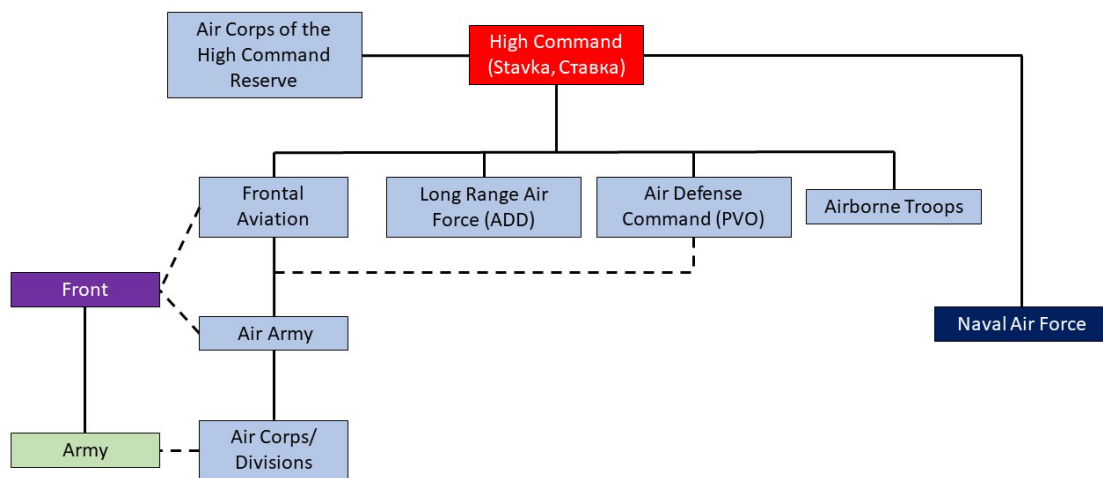
Figure 13. VVS Organization in Late 1942

Source: Created by author.

Operation Uranus and Saturn - 1942-1943 Winter Offensives

     After an ineffective Soviet offensive near Demyansk and Kharkov in May 1942,

German forces attacked eastwards towards Voronezh and the Volga River. By late

August, the German Army Group B was steadily pushing back the newly reorganized Stalingrad Front towards the front's namesake.[38]

During the early portions of the Stalingrad campaign, the bulk of Soviet air forces were the VVS' 8th Air Army and the 102d Fighter Air Division of the PVO. Forces from northern regions augmented these units as the campaign drew on.[39] A VVS Stavka representative in the area coordinated efforts between the frontal aviation, ADD, and PVO assets, a technique that continued throughout the war.[40] Unlike previous campaigns, these forces focused on decisive points in the battlespace rather than piecemeal commitments throughout the battlespace.[41] These points were typically in the Red Army's close area. The majority of air strikes were often no more than five kilometers from the front line and not closely controlled.[42] Results, though, were still lackluster. The Germans did not note any significant effects created by Soviet airpower during the Blue offensive.[43] As the Germans committed more of their strength towards taking Stalingrad, the Soviets prepared forces for a counterattack, named Operation Uranus.

Uranus commenced on 19 November 1942, quickly surrounding the German Sixth Army within one week. Three Soviet air armies participated, the 8th Air Army aligned with the Stalingrad Front, the 16th Air Army with the Don Front, and the 17th Air Army with the Southwestern Front.[44] A Stavka representative, Major General F. Y. Falaleyev at first but later Novikov, coordinated the efforts of these air armies when necessary including such tasks as reorganizing units and controlling reserves.[45] During these offensives, the Soviets executed an operational reform they termed the air offensive.

The air offensive was a concept supported by Novikov but promulgated by the Stavka representative in the Stalingrad area, Major General F. Y. Falaleyev, with roots in deep battle and deep operations.[46] Sometimes coordinated between multiple fronts by the area's Stavka VVS representative and his small planning team, an air offensive was simply applying the principle of mass to airpower. Analysis of earlier fighting suggested that the VVS diluted its efforts too much. Air offensives emphasized devoting the vast majority of air assets towards enabling the main land effort. For example, the 17th Air Army allocated its entire force to supporting the 5th Tank Army.[47] The air offensive was used during the 1942-1943 offensives to set conditions and break through defensive belts sometimes ten to twenty kilometers in depth.[48] Prior to and during the initial ground attacks, aircraft struck artillery positions and strongpoints in the defensive line. Other planes interdicted reserves moving to the breakthrough zone.[49] Integration between land and air forces steadily improved during this time as well.

While Stavka representatives coordinated between the various air forces (Frontal Aviation, Stavka reserve air groups, ADD, and PVO), air armies established links between frontal aviation and ground forces. Interestingly, the VVS had not issued any guidance as to how air armies and land forces should coordinate below the front level. Each front handled this integration differently as a result. For example, in December 1942, the 17th Air Army coordinated with the Southwestern Front by setting up auxiliary control posts (VPU, *vspomogatel'nyy post upravleniya*) at the front command post (CP). The deputy air army commander led the VPU and liaised with both the air army CP and one of the air corps by both wired and radio connections. Air corps and divisions were allocated to support specified field armies, but the bomber divisions were kept under the

control of the air army. This allowed the air army commander to commit the bombers as needed to either support field armies or attack targets of interest to the front. Air corps and division commanders were often located at supported field army CPs with connections back to their respective units.[50] During the same period, the 2d Air Army created a different structure with the Voronezh Front intended to support the Front's two main spearheads.

The 2d Air Army divided its forces into two roughly equal groups, a northern and southern group. The air army commander established two VPUs. Each was posted to one of the Voronezh Front's two shock armies. During the first days of the operation, the air army commander controlled both groups but, after in the initial phase, control was delegated to the deputies located at the VPUs to enable faster decision-making. Later in the campaign, the field armies sent tasks directly to the air groups through liaisons, also in an effort to speed up tempo.[51] These two disparate systems highlight the fact that the VVS recognized the need for improved coordination but had not identified a best practice yet. The Soviets were also still refining their approaches to tactical command and control during these operations.

While the VVS and PVO established procedures for radar- and radio-controlled air superiority missions, CAS and AI missions were still only marginally effective for several reaons. First, the still relatively small number of fighters available to the VVS meant that many CAS and AI missions were disrupted or diverted by German fighters. This lack of fighters caused the Soviets to sometimes use attack aircraft (primarily the Il-2) for defensive counterair patrols with varying results.[52] Second, while coordination was improving, real-time integration between troops on the ground and aircraft was little

changed from 1941. Aircrew relied primarily on ground signals to identify friendly troops. If aviators could not discern friend from foe, they simply flew several kilometers into the enemy's rear and attacked targets of opportunity.[53] Ultimately, the reforms implemented during the winter offensives of 1942-1943 greatly improved the operational and, to a lesser degree, tactical integration between air and land maneuver. The Red Army and VVS developed an effective system of synchronizing land and air forces at higher levels (field army and air army and above). But tactical C2—the ability to command and control an air battle including nominating or changing targets or missions in flight—remained elusive. Much room for improvement remained as both sides prepared for operations around Kursk.

<p align="center">Kursk</p>

Between April and May 1943, the Red Army pushed the Germans out of the Kuban and back across the Kerch Strait into Crimea. This battle was an important period for the VVS as it refined lessons learned during the winter campaigns, especially pertaining to air control and air-land integration. The VVS put these lessons to good use around Kursk one month later.

Showing the atrophy of German strength by mid-1943, the main German focus was simply to reduce the Kursk salient. Army Group Center attacked the north shoulder, while Army Group South struck the southern shoulder. Stavka, well aware of German intentions, heavily reinforced and fortified the salient as well as prepared counterattack forces around Orel and south of the salient. The Central Front, with the 16th Air Army, held the northern part of the salient while the Voronezh Front, with the 2d Air Army assigned and reinforced by the 17th Air Army, held the southern portion. The Steppe

Front with the 5th Air Army were positioned at the base of the salient to reinforce threatened sectors or counterattack. [54] Additionally, Novikov personally represented Stavka in the area and held control of several Stavka reserve air corps for allocation by himself. [55] This large force represented the first time in a major operation that the VVS considerably outnumbered the Luftwaffe: 2,453 VVS aircraft against 1,850 Luftwaffe planes. [56] This large air force conducted shaping operations beginning as early April but the main ground attack began on 5 June 1943.

Operation Citadel was a dismal failure for the Germans but set the stages for the two-year Soviet general offensive that ended in the capture of Berlin. Despite hard fighting, including massive tank battles on the dusty steppes, the Germans were stopped well short of their objectives. The greatest penetration was achieved in the south to a distance of only thirty-five kilometers. On 12 July, Soviet forces conducted a large counteroffensive north of the Kursk salient towards Orel, sapping German strength. By 18 July, forces from both Army Group Center and Army Group North withdrew towards their initial lines.

Throughout the campaign, both during defensive and offensive operations, VVS forces focused most of their efforts on air superiority and CAS missions. The VVS and PVO conducted methodical, sustained fighter sweeps both over the Red Army lines as well as deep into the German rear area. Simultaneously, strike aircraft pounded German ground forces in the close area. While the air armies did conduct smaller, steady-state missions consistent with previous operations (regular strikes consisting of four to ten close support aircraft escorted by four to six fighters), they also conducted the first "mass" air offensives (the VVS now called these operations "mass air offensives").

Essentially, in addition to massing air forces along the decisive axes, large missions were flown to deliver powerful effects at opportune moments. The Voronezh Front specifically noted the effectiveness of large numbers of Il-2s (sometimes an entire regiment or more) attacking tank columns in the field army's deep area.[57] During offensive operations, the Red Army employed techniques to echelon their artillery and aviation fires. Artillery fired to depths of three kilometers, while aviation attacked beyond that range.[58] In short, the VVS grew adept at using airpower as a component of a combined arms team in the close area. Command and control systems were vital to that effort.

The VVS used VPUs to coordinate with the field armies of each front. Additionally, liaison officers, often aviation unit commanders or operations staff, were attached to lower headquarters. Air corps or divisions were often allocated to support specific field armies or corps. In such cases, the corps or division commander or staff attached to the field corps headquarters and maintained contact with the aviation unit through radio. The commander assigned targets and informed aviators of the current situation. In some cases, liaisons were attached as low as the brigade level. This usually occurred during offensive operations when it became more difficult for aircrew to discern friendly lines.[59] Kursk was also the first operation in which some of the techniques developed to control fighters during air superiority missions were utilized to control close support missions.

The VVS established forward command posts, sometimes referred to as forward direction stations, around ten kilometers behind the front lines to provide some tactical control. Ground and air liaison officers manned the stations. However, there were not enough posts to control the entire salient and many lacked radios. Often relied on other

signal forms such as colored rockets or ground markings to indicate target directions.[60]

These signals were not always successful as the massed mechanized forces maneuvering on the steppes produced huge amounts of dust, sometimes extending more than fifteen kilometers beyond the front lines.[61] Those forces which used field radios at forward posts, notably the 16th Air Army, were more successful at integrating air attacks into the overall battle.[62] During subsequent operations, forward direction stations were uniformly employed and included radios to provide target and friendly information directly to strike aircraft. The system developed and refined at Kursk remained the Red Army and VVS standard for the duration of the war with only minor adjustments.

<p align="center">Follow-Through</p>

After the victory at Kursk, the Red Army began an inexorable advance towards Berlin. Even as control of the air swung decisively in favor of the Soviet Union, the VVS still focused the predominance of its efforts on CAS. Nearly half of all sorties flown by the entire Soviet Air Force were CAS missions. While the VVS flew some deep AI missions, the air forces focused on areas within just a few kilometers of the front lines in most cases. The Soviets themselves stated this was because "enemy troops, both in offense and defense, were never deployed to any depth. The great mass of [German] troops was concentrated on the battlefield."[63] The command and control system begun at Stalingrad and refined in the Kuban and at Kursk remained largely unaltered for the remainder of the war.

The chief adjustments made were to ensure the presence of air liaisons at applicable army headquarters as well as ensure radio availability both for the liaisons and for forward controllers. In many cases the liaisons were air commanders or deputy

<p align="center">74</p>

commanders who controlled their units (allocating sorties and passing mission information prior to aircraft launch) from the supported army unit's command post.[64] This system was well designed to provide CAS and limited AI but was so integrated into land maneuver that independent air maneuver was practically non-existent.

<div align="center">Effectiveness</div>

The effects typically demanded of the VVS were to secure air superiority over the front, facilitate the main assault groups' breakthrough, and disrupt enemy artillery and reserves. These desired effects present challenges to definitively proving results. Rather than attempt to quantify VVS impacts on the war, a review of both Red Army and German army officers perceptions on VVS accomplishments will suffice for a determination of overall effectiveness.

The Red Army staff studies are regrettably vague in their assessments of airpower, although certain analyses suggest that lack of information indicates relatively ineffective performance. For example, the Voronezh Front study of operations in January and February 1943 stated that, due to weather, "a number of tasks for suppressing and destroying the enemy, which had been entrusted to our aviation, had to be resolved by the artillery."[65] In contrast, later operational analyses included more positive comments indicating improvements in VVS performance. The Kursk study concluded that air operations were highly effective, noting that "the assistance rendered by our aviation to the ground forces in defeating the attacking German groups of forces was enormous."[66] Perhaps reflecting the greatly improved capabilities and size of the VVS, the report for Operation Bagration contained numerous pages analyzing aviation operations and concluded with the simple statement that "the activities of the air force in the Belorussian

operation were effective and guaranteed the successful advance of the ground forces to a great depth."[67] In short, one can reasonably assume that the Soviets considered their aviation to be effective in that it enabled land maneuver through providing fires in the close area, while protecting friendly forces from air attack.

Many Germans reached similar conclusions. While noting that the VVS employed almost exclusively in the close area, German officers concluded that Soviet air efforts were "an essential ingredient of the Soviet victory."[68] German leaders after the war noted that even at the end of the war Red Army aviation conducted operations "primarily against all manner of targets within the main line of resistance and the immediate vicinity."[69] The Germans also noted that bomber attacks into the deep area significantly increased during 1944, but their primary effect was to grind down the Luftwaffe's ground organization.[70] This statement also suggests that a large portion of ADD bombing efforts were aimed at securing air superiority through air base attacks rather than conducting AI against German land forces. In short, German officers viewed the VVS, especially its ground-attack units, as making important contributions to the victorious Red Army offensives of 1943 through 1945.

Command and Control

The Red Army arrived at a system akin to the German's in many respects by 1945, but the VVS command and control structure was more flexible and focused than its German counterpart. The system may be broken into two levels: operational-strategic and operational-tactical. Each level gave commanders variable authorities which provided great flexibility in the conduct of air operations.

The operational-strategic level of the VVS structure consisted of the Stavka representatives present in the area (often Novikov himself), the front commanders, and the air army commanders. There was no explicit description of the relationship between these three actors but together they determined the operational concepts that drove air maneuver across multiple fronts (akin to the JAOP). The Stavka representative commanded the employment of ADD assets as well as the dispersal of Stavka Reserve Air Corps. The importance of managing Stavka reserves cannot be understated. Stavka Reserve Air Corps often accounted for more than half of the frontal aviation during major operations, meaning that the Stavka representative possessed a powerful fist he could direct at critical points during an operation.[71] To keep this potent force from being diluted, in 1944 Novikov directed that air army commanders could only provide mission-type orders of durations not less than a day in length to those reserve units delegated to air armies.[72] Additionally, the Stavka representative coordinated efforts such as air offensives between the various air armies within a group of fronts during an operation. The representative also facilitated the PVO asset integration into the overall air plan. Figure 14 below illustrates this construct. Front commanders, also based on coordination with Stavka, provided general orders to their air army commander. Essentially, this rather informal system functioned based on the concept that the Stavka air representative understood the strategic side of the operation in question and coordinated the efforts of airpower in the area towards the overall operational purpose.
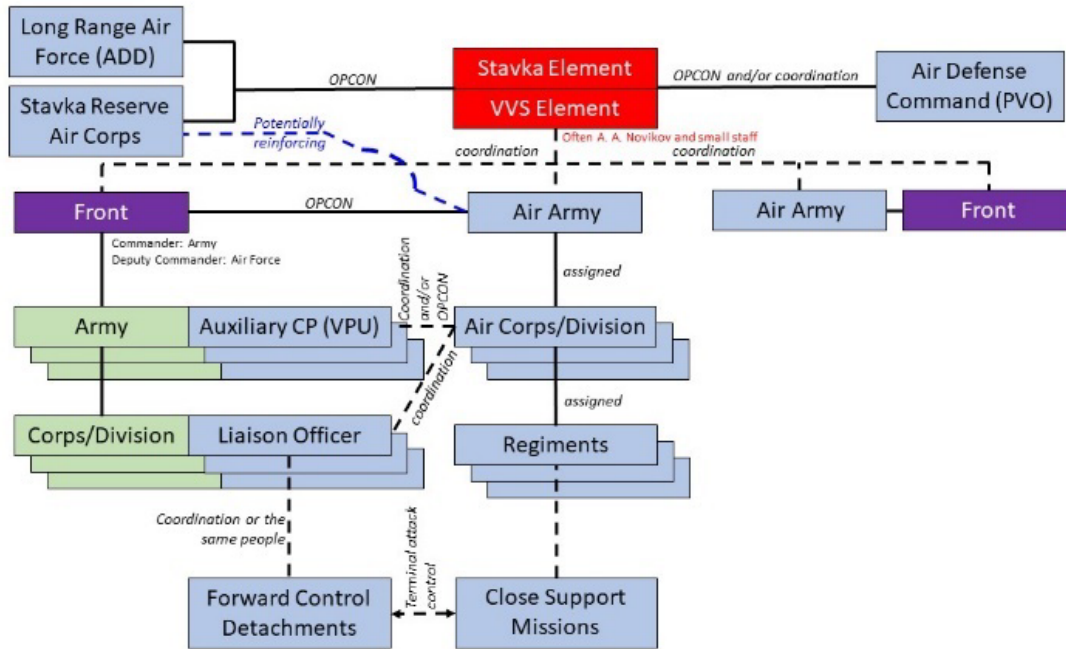
Figure 14. Soviet Operational Command and Control After 1943

Source: Created by author.

At the operational level, front commanders and air army commanders worked together (especially after the 1942 reforms in which air army commanders became deputy front commanders) to determine the majority of apportionment and allocation decisions for the air army. Air army commanders were able to use both mission-type and task orders as the individual leader deemed prudent based on the situation. Typically, the air army commander closely controlled the first few days of an operation but thereafter quickly pushed authorities down to air corps and air division commanders through mission-type orders. Preparatory missions flown prior to the commencement of the ground offensive were usually planned at the air army level and executed at the air corps or division level. In some cases, air army staff coordinated the integration of various air-based effects such as fighter escort. If air corps or divisions contained a combination of

different regiment types, this task might be delegated to the lower levels. In general, air armies apportioned aviation resources for the front.

When considering apportionment at the front-air army level, one should understand that the Red Army system was not designed for commanders to weight mission types like CAS over others like AI. It was similarly difficult to prioritize certain effects over others. For example, the system was not conducive to an air army commander directing that the reduction of German artillery was a primary focus. Rather, the system was more focused on providing close support to the shock and exploitation ground forces. Apportionment from the VVS perspective was more about ensuring support for the main ground effort. As a result, a common air army task organization was for the air army commander to keep direct control of most of the bomber divisions in his command but delegate control of fighter and ground-attack divisions to air corps or temporary groups to directly supported certain ground formations.

This task organization model was apparent in the liaison system constructed within each front. As noted previously, each air army commander liaised heavily with front commander. Air corps and divisions placed VPUs, usually manned by the unit's deputy commander, at the supported field army's command post. Key ground corps and division often received liaison officers from the air corps or air division as well. Once the ground operations began, the VPU played a major role in mission allocation. The liaisons at the VPU either had the authority to contact divisions or regiments directly to launch missions, or sent information back to the air corps or air division headquarters for relay. Regardless of the method used, air corps and air divisions were essentially permanently

allocated to the supported field army or corps and possessed virtually complete control of the allocation of missions to provide that support.

Regiments and squadrons executed the missions assigned by air corps or air divisions. Most missions were small and conducted at the squadron level. Larger missions, including mass raids as part of air offensives, were usually planned by higher headquarters and often involved the participation of entire regiments. Prior to 1943 there was minimal control of these missions once they launched but, during Kursk and especially afterwards, the tactical C2 system evolved to be roughly commensurate with those systems in place in the German and western allied militaries.

The Soviet tactical C2 system began as a method purely for controlling air superiority missions. After experimentation at the Kuban, the Red Army implemented the system at Kursk. The VVS improved on the system throughout the remainder of the war, building a highly effective CAS system by the end of the war.

The liaison structure described previously made Frontal Aviation assets very responsive to ground force needs, especially compared to some of the other air forces during World War II. Depending on the situation, the air unit could often have aircraft overhead within twenty to forty-five minutes of a request for air support. The liaisons also facilitated the planning of AI targets, although these targets were still generally relatively close to the enemy front line. If appropriate, entire squadrons or even regiments flew these raids. Figure 15 below illustrates the tactical C2 network in 1945 derived from a 1946 Soviet manual. Either the VPU or lower level liaison officers exercised in-flight control as the situation warranted.
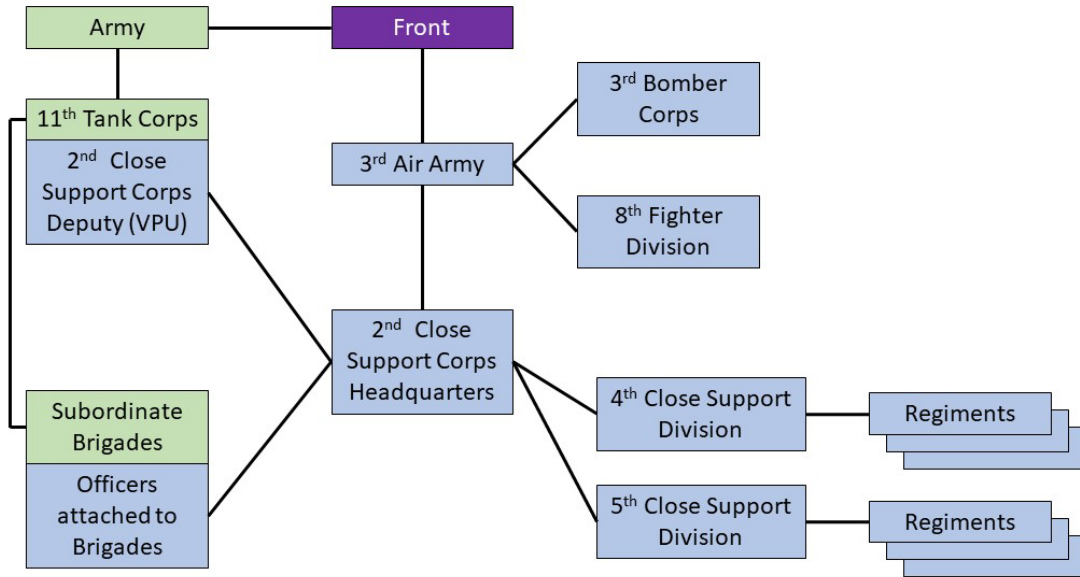
Figure 15. Soviet Tactical Command and Control System, 1945

Source: S. S. Krupin, *Shturmovoi Aviakorpus vo Vzaimodeistii s Tankovim Korpusom Pri Razvitii Proriva Fronta* (Moscow, Russia: VKAKiSS VVS Krasnoi Armii, 1946)/

The model was rather simple. Essentially, ground-attack aircraft flew to a specified point, somewhat akin to a modern Contact Point, then contacted a forward control post. At Kursk and other early battles, these posts were largely static. Later, static posts continued, but mobile posts that maintained contact with forward ground elements augmented the static posts. The mobile posts used trucks or tank chassis. The controllers at these posts provided TAC for the attacking aircraft, including some form of target correlation. This system significantly improved risk mitigation relative to earlier campaigns, which predominantly relied on aircrew visually discerning targets or sighting signals like ground markings or colored rockets.

<u>Analysis of the Red Army System</u>

The Red Army system represented a near-complete subordination of air maneuver to land maneuver. While the ADD did make efforts later in the war to conduct more AI, the primary missions for the VVS were air superiority and CAS. Despite apparent weaknesses associated with those emphases, the system displayed several strengths worthy of note, including considerable C2 flexibility and an adroitness at integrating joint fires in the close area relative to other militaries of the period. Several key observations should be observed within the VVS system. The Red Army created a JTF-like C2 structure which both established common objectives for the air and land forces as well as enabled flexible integration of air and land maneuver. Despite the subjugation of airpower to land power, the Red Army possessed a sophisticated view of the VVS, treating it as both a maneuver element and a fires element depending on the situation.

The Red Army command and control system developed by 1943 and refined until the end of the war illustrated significant flexibilities in joint force C2. The air army commander, as the deputy front commander, was an important part of the front's staff and thus included in front planning efforts from the beginning. Airpower was not added at a late stage in planning as an "enabler," but was integral to planning and execution from the start of an operation. The front commander established the overall objectives and the air army commander, in coordination with the Stavka representative, planned the air army's efforts to achieve those objectives. In most cases, air army commanders remained in command for the duration of the war, often aligned with certain front commanders.[73] Such close working relationships created trust between front commanders and air army commanders. Further, the fact that the liaisons were often air commanders or deputy commanders gave them both immense credibility as well as trustworthiness

since the ground leaders knew the air liaisons had the authority to deliver on their promises. The command and control system structurally enshrined these relationships.

The Soviet Union's C2 system demonstrated the benefits of varying authority levels for allocation and even apportionment throughout a chain of command. The VVS was able to conduct both centralized control and decentralized execution operations as well as decentralized control and execution operations during campaigns. During the early portions of an operation, during which air armies executed mass air offensives, the air armies kept close control of their subordinates. The level of integration between air corps and air divisions to manage large, multi-squadron or regimental-sized missions in the close area demanded that the air army maintain control. However, as missions became smaller in terms of number of aircraft and more focused on close support of advancing ground units, the delegation of allocation authority to air corps, air divisions, and regiments enabled the various subordinate units to establish their own tempo commensurate with their supported unit. This transfer of authority highlights the Red Army's sophisticated perception of airpower.

The VVS system treated aviation both as a maneuver force and a fires element, depending on the context. Air offensives were the VVS acting as a maneuver force. The air army commander was given objectives which he accomplished as best as he saw fit with little close control from ground forces. Once the ground troops began their offensive, VVS forces typically transitioned to close support, usually CAS. Here aircraft were treated as fires assets. They launched based on requirements sent through the liaisons at ground unit headquarters and often received targeting information from forward air controllers or VPUs. While the aircraft were not always closely controlled,

they struck targets nominated by the ground forces. The VVS' ability to move from one form of execution to the other added significant benefits to the Red Army's airpower. Essentially, when the required effects were less specific or demanded more firepower (i.e. "neutralize artillery in the rear area" versus "destroy that company of armor"), the VVS could execute as a maneuver element to bring airpower to bear. Conversely, when the firepower needed to enable the success of the land force was reactive in nature or posed significant risk to friendly forces, airpower could be treated as a fires element. This flexibility in execution methodology is apparent within the USJF system, but the theoretical foundations seem to be absent. Discussion in Chapter 5 addresses this dichotomy.

The Soviet system represented less an integration of air and land maneuver as the subjugation of air maneuver within the constraints of land maneuver. Airpower was an additional mechanism to ensure the success of the Red Army in the conduct of deep operations and deep battle. Despite the subservience of air maneuver, the Soviet system presents several lessons for the USJF. The retention or delegation of control authorities and air offensives allowed air commanders to influence tempo in significant ways. Leaders could mass airpower at decisive points through air offensives. When operations did not require such mass, the delegation of authorities enabled tempo. Delegating authorities gave subordinate commanders the ability to maintain a high operational tempo by cutting out middle-men and reducing the coordination required to conduct missions. Those same characteristics demonstrated the conceptually sophisticated view of airpower as both a maneuver force and a fires element. See Table 4 below for a summary of the Soviet system.

Table 4.   Summary of the Soviet System

Principles
- Success of the army is vital to overall success in warfare   - Air maneuver's purpose is to enable the success of land maneuver through close support provided to achieve three main operational-tactical objectives: - Protect friendly forces from enemy air attack   - Provide fires in the close area to enable a breakthrough of the enemy's defensive zone   - Protect and provide fire support for exploitation and pursuit forces   - Stavka coordinates the efforts of the various air services (Frontal Aviation, ADD, PVO) to achieve operational objectives   - Air offensives used to mass and guide airpower   - Frontal Aviation a key part of a front. Front commanders were Army officers, deputy commanders were VVS officers typically "dual-hatting" as the front deputy commander and the front's air army commander.   - Operational control (apportionment and allocation) flexible between air armies, air corps, and air divisions

Pros	**Cons**
- Flexible operational C2 enabled effective close support during confused and fast-moving battles - Thorough liaison system ensured integration of airpower into land maneuver - Mass at decisive points during battles - High close support tempo	- Minimal strategic attack or AI—ceded airspace in enemy rear - Sometimes inefficient risk mitigation procedures - Primacy of army objectives over other considerations inhibited independent air maneuver

Observations Relating to Operational Art
- Integration and C2 effectiveness is directly proportional to the efficacy of the communications equipment extant at the various responsible agencies   - Non-standard risk mitigation techniques reduce tempo and can result in an inability to deliver the needed effects

Source: Created by author.

[1] Richard P. Hallion, *Strike from the Sky: The History of Battlefield Air Attack, 1911-1945* (Washington, DC: Smithsonian Institute Press, 1989), 260.

[2] Georgii S. Isserson, *The Evolution of Operational Art*, trans. Bruce W. Menning (Fort Leavenworth, KS: Combat Studies Institute Press, 2013), 110.

[3] Ibid., 53-67.

[4] James Sterrett, *Soviet Air Force Theory, 1918-1945* (New York, NY: Routledge, 2013), 50.

[5] Ibid., 58.

[6] Soviet Defense Ministry, *The Soviet Air Force in World War II*, trans. Leland Fetzer, ed. Ray Wagner (Garden City, NY: Doubleday & Company, 1973), 15-16.

[7] Sterrett, 50-51.

[8] James S. Corum, "The Spanish Civil War: Lessons Learned and Not Learned by the Great Powers," *The Journal of Military History* 62, no. 2 (April 1998): 331.

[9] Von Hardesty, *Red Phoenix: The Rise of Soviet Air Power, 1941-1945* (Washington, DC: Smithsonian Institution Press, 1982), 49.

[10] Hardesty, 50; Sterrett, 61.

[11] Hardesty, 50.

[12] Corum, "Spanish Civil War," 330.

[13] Brian R. Sullivan, "Fascist Italy's Military Involvement in the Spanish Civil War," *The Journal of Military History* 59, no. 4 (October 1995): 707.

[14] Michael Alpert, "The Clash of Spanish Armies: Contrasting Ways of War in Spain, 1936-1939," *War in History* 6, no. 3 (July 1999): 339.

[15] Corum, "Spanish Civil War," 330.

[16] Edward J. Drea, *Nomonhan: Japanese-Soviet Tactical Combat, 1939*, Leavenworth Papers No. 2 (Fort Leavenworth, KS: Combat Studies Institute, 1981), 81-86.

[17] Sterrett, 69; Hallion, 126.

[18] Sterrett, 71-72.

[19] Hardesty, 52.

[20] Sterrett, 75. Hardesty, 57-58.

[21] Hardesty, 57-58.

[22] Sterrett, 86.

[23] Walter Schwabedissen, *The Russian Air Force in the Eyes of German Commanders*, USAF Historical Series No. 175 (Maxwell AFB, AL: Air Force Historical Research Agency, 1960), 63, https://www. afhra.af.mil/Information/Studies/Numbered-USAF-Historical-Studies-151-200/.

[24] Soviet Defense Ministry, 69.

[25] Glantz and House, 80-81.

[26] Soviet Defense Ministry, 71.

[27] Hardesty, 80.

[28] Sterrett, 99.

[29] M. Kozhevnikov, "Birth of the Air Armies," *Aerospace Historian* 22, no. 2 (Summer 1975): 73.

[30] M. Kozhevnikov, *The Command and Staff of the Soviet Army Air Force in the Great Patriotic War, 1941-1945* (Washington, DC: US Government Printing Office, 1983), 44.

[31] Ibid., 45.

[32] Hardesty, 86.

[33] Kozhevnikov, *Command and Staff*, 70.

[34] Ibid., 71-72

[35] Sterrett, 100.

[36] Kozhevnikov, "Birth of the Air Armies," 74.

[37] Sterrett, 101.

[38] Glantz and House, 122.

[39] Hardesty, 93-94.

[40] Soviet Defense Ministry, 117.

[41] Hardesty, 93-94.

[42] Kenneth R. Whiting, "Soviet Air-Ground Coordination, 1941-1945," in *Case Studies in the Achievement of Air Superiority*, ed. Benjamin F. Cooling (Washington, DC: Government Printing Office, 1991), 127.

[43] Schwabedissen, 97; Hardesty, 100.

[44] Hardesty, 106.

[45] Kozhevnikov, *Command and Staff*, 96.

[46] Hardesty, 94-95.

[47] Kozhevnikov, *Command and Staff*, 97.

[48] Soviet General Staff, *Rollback: The Red Army's Winter Offensive Along the Southwestern Strategic Direction, 1942-1943*, ed. and trans. Richard W. Harrison (Solihull, UK: Helion & Company Limited, 2016), 29.

[49]

[50] Ibid., 121.

[51] Soviet General Staff, *Rollback*, 164.

[52] Ibid., 125.

[53] Ibid., 126.

[54] Glantz and House, 160-165.

[55] Hardesty, 153.

[56] Sterrett, 112.

[57] Soviet General Staff, *The Battle of Kursk: The Red Army's Defensive Operations and Counter-Offensive, July-August 1943*, ed. and trans. Richard W. Harrison (Solihull, UK: Helion & Company Limited, 2016), 196-197.

[58] Ibid., 370.

[59] Ibid.

[60] Hallion, 242.

[61] Sterrett, 116.

[62] Soviet General Staff, *Kursk*, 91.

[63] Soviet Defense Ministry, 384.

[64] Sterrett, 120-122.

[65] Soviet General Staff, *Rollback*, 246.

[66] Soviet General Staff, *Kursk*, 197.

[67] Soviet General Staff, *Operation Bagration: The Rout of the German Forces in Belorussia, 23 June-29 August 1944*, ed. and trans. by Richard W. Harrison (Solihull, UK: Helion & Company Limited, 2016), 503.

[68] Schwabedissen, 390.

[69] Ibid., 333.

[70] Ibid., 366.

[71] Kozhevnikov, *Command and Staff*, 225.

[72] Ibid., 148.

[73] Hardesty, 245-249.

CHAPTER 4

THE 1973 ARAB-ISRAELI WAR – THE ISRAELI AIR FORCE AND ITS ARMY

> We came in to fight [in 1973] like we did in 1967 but the conditions were different. So it took us about seven days to overcome the uncertainty and understand how to do our job properly.
> —N. Merchavi, Israeli Air Force pilot on his experience in the Yom Kippur War

The 1973 Arab-Israeli, sometimes called the Yom Kippur War or the Ramadan War, put a new paradigm of warfare on display for the world to observe. Despite considerable combat operations around the world in the preceding years, including US involvement in Vietnam, the 1973 war represented the first major conflict in which air and land forces maneuvered in the same areas, while air forces contended with significant missile-based defenses. This conflict, and the lessons derived by the United States, Israel, and other observers, played a profound role in the development of tactical and operational theory through the 1970s and into the 1980s.[1] In general, this war highlighted both the efficacy of a highly trained and capable air force conducting interdiction against a mechanized land force in open terrain. However, the war also demonstrated the importance of a responsive command and control structure and the difficulty of conducting air maneuver without air superiority. Finally, this war showed several examples of the mutually supportive and the *mutually enabling* capabilities of air and land maneuver.

Background

Israeli Operational Thought Prior to 1973

Israel's outlook concerning military operations in 1973 stemmed from its strategic position and its experiences during earlier wars, especially the 1956 Suez Crisis and the

1967 Six Day War. The tiny state's strategic realities shaped military leaders' perceptions of the constraints and requirements of the Israeli Defense Force (IDF).

The lack of strategic depth in Israel drove much of the IDF's operational approach. In the heart of the country, there is a paltry one hundred kilometers (sixty-two statute miles) from Tel Aviv to the Allenby Bridge on the Jordan River. Put another way, a fighter aircraft flying at the speed of sound can traverse the entire state east-to-west in less than six minutes! A tank could drive the same distance in just a few hours. This incredibly small size means that Israel had virtually no strategic depth during its period of significant conflict with its Arab neighbors from the 1940s to the 1970s.

During that period, small clashes and raids punctuated by major conflicts characterized Israel's existence. The Israelis also concluded that any major conflict mandated rapid and decisive victory. This conclusion was based on the premise, seen in both the 1956 and 1967 wars, that great powers (either the US or the Soviet Union) would intervene to end the conflict. To address this, the IDF developed its own warfighting theory, sometimes called "offensive preemption."

Offensive preemption comprised three concepts. First, a powerful Armored Corps and Israeli Air Force (IAF, *Kheil HaAvir*) provided deterrence (*Harta'a*). Second, Israeli intelligence provided early warning (*Hatra'a*) of imminent attacks. Sufficient warning allowed the armor-airpower team to preemptively attack to achieve the third concept, decisive victory (*Hacra'a*).[2] The IAF created its own operational outlook which nested within this overall theory.

The IAF's purpose within offensive preemption was to protect the homeland (to enable unfettered mobilization) while simultaneously interdicting attacking forces. The

IAF defined four objectives to achieve this overall effect. First, rapidly achieve air superiority over both friendly and enemy territory. Second, disrupt enemy armies' rear areas to inhibit attacks or reinforcement. Third, create time for Israeli mobilization by attacking enemy fielded forces and screening friendly forces. Finally, once the ground force was mobilized, set conditions for a successful counterattack (basically, attrite the enemy's forward forces and interdict or otherwise disrupt the enemy rear area).[3] This approach to warfare, illustrated in Figure 16 below was best exemplified in the Six Day War.
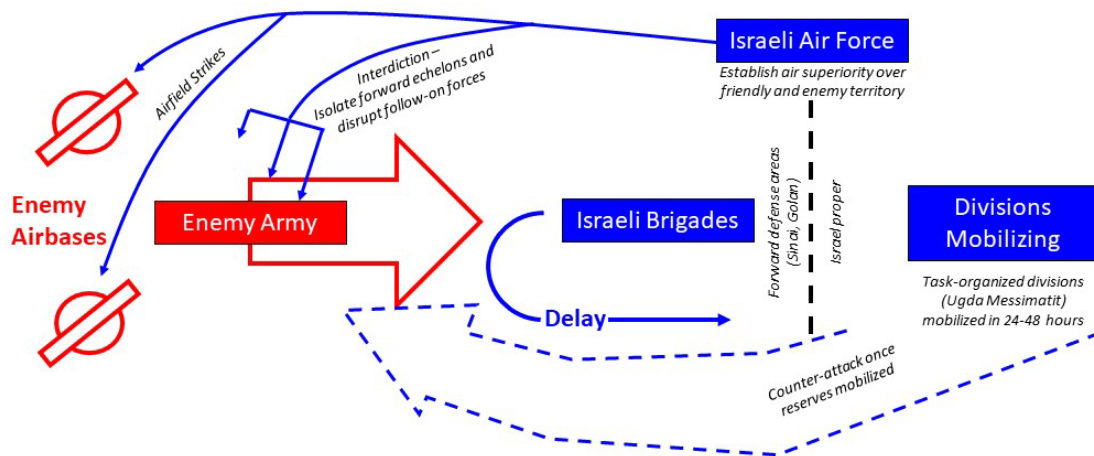
Figure 16. Israeli Operational Concept between 1950 and 1973

Source: Created by author.

The IDF perceived that this operational theory required a powerful armored force and air force. While the IDF highly valued paratroopers, the 1956 and 1967 wars convinced IDF leaders that armor and airpower deserved the investment of resources over

other branches.[4] Israeli leaders established this force structure after the Suez Crisis and the General Staff reinforced it after the Six Day War.

<center>Six Day War, 1967</center>

The Six Day War was the exemplar of offensive preemption theory. On 5 June 1967, the Israelis launched a surprise attack on three fronts—the Sinai against Egypt, the Golan against Syria, and into the West Bank against Jordan. The IAF commenced the war in a famous morning attack—Operation Focus—against Egyptian airbases. Subsequent attacks decimated the Jordanian and Syrian Air Forces and even inflicted losses on the Iraqi Air Force later in the war. On that day, the IAF destroyed 416 Arab aircraft, 393 of which were caught on the ground.[5] The IAF began a sustained interdiction campaign that intensified dramatically in subsequent days since the IAF did not need to devote many resources to maintaining air superiority.

Simultaneously, Israeli task-organized armored brigades attacked into the Sinai, Golan Heights, and West Bank. Israeli interdiction played a significant role in disrupting and attriting Arab forces, enabling the advance of Israeli armored units. Notable examples of effective interdiction included the decimation of Egyptian forces both advancing and retreating through the Mitla and Giddi Passes.[6] In the West Bank, IAF aircraft disrupted a Jordanian armored convoy, buying sufficient time for Israeli forces to secure Jerusalem.[7]

<center>Impact of the Six Day War and the War of Attrition</center>

In many ways, the success of the Six Day War was a catalyst for positive change in the Egyptian military, while simultaneously stagnating the IDF. In broad terms, the Egyptians concluded that a war of more limited objectives with improved coordination

<center>93</center>

between the Arab states increased the likelihood. Significantly for the IAF, the Arabs also learned that they must find means to mitigate Israeli airpower. The Israelis, in contrast, saw the war as a vindication of their force structure and operational theory. Between 1967 and 1973 there were, therefore, two main operational themes worth noting: increased emphases in Arab states on air defenses and allied coordination, and an increased emphasis within the IDF towards maintaining a powerful IAF and armored force.

After their devastating defeat in 1967, the Egyptian and Syrian militaries conducted thorough analyses of their experiences. The Egyptians deduced that the Israelis were reliant on airpower to protect their own ground forces, to deliver firepower against enemy units, and to enable vertical flanking maneuvers.[8] During the Six Day War, the Egyptians recognized the significant impact of IAF attacks on their forces, especially against infantry. Based on the rapid defeat of the Egyptian Air Force in 1967, the Egyptians looked to the Soviet Union to developed their ground-based ADA capabilities.[9] During the War of Attrition, the Egyptians recognized that IAF operations were significantly curtailed by the Soviet-supplied SAM umbrella near the Suez Canal.[10] These factors, as well as the better alignment of military actions with war aims discussed previously, significantly influenced Egyptian strategy and tactics during the 1973 war. During the same time period, the IDF was less successful in preparing for the 1973 war.

The Six Day War was an overwhelming success for the IDF. As a result, the Israelis were prone to reinforce the aspects of their military system perceived as decisive: armor and air forces. In 1972, 50% of the entire IDF budget went to the IAF, 30% went to the armored corps, and the remainder of the IDF sparred over the remaining 20%.[11]

During this period, the IDF even converted several of its infantry units to armor units.[12]

As the War of Attrition consumed the scant resources of the IDF between 1967 and 1970,

the perception that the IAF was an end-all weapon—capable of achieving strategic

objectives with minimum lives and resources expended—only increased.[13] The IAF

underwent a major transformation between 1967 and 1973 in an effort to keep pace with

the changing environment while still delivering the effects demanded of it.

The IAF, in some ways a victim of its own success in 1967, found itself

struggling to find the means to deliver decisive effects as in the Six Day War while

contending with the radically changing military environment. The success of Operation

Focus in defeating the Arab air forces enamored the IAF of large, intricately planned

mass strikes. As a result, by 1973 there were at least five major plans on hand when the

Arabs attacked, including Model V (*Dougman V*) to destroy Syrian ADA and Challenge

(*Tagar*) to destroy Egyptian ADA along the Canal.[14] The major challenge that prevented

the IAF from operating similarly to 1967 (and which was the target of Model V and

Challenge, illustrating the acute Israeli understanding of the problem) was the massive

increase in Arab air defenses.

While the Arab states possessed ADA during the Six Day War, the number and

composition of Arab ADA improved substantially between 1967 and 1973. In 1967,

about 1,000 guns and twenty-four SA-2 batteries comprised the Egyptian ADA

network.[15] In 1973, the Egpytians fielded more than 150 batteries of SA-2s, SA-3s, and

mobile SA-6s as well as several thousand air defense guns, including ZSU-23-4s, and

SA-7 man-portable SAMs.[16] The Syrian ground-based air defenses likewise expanded

from practically non-existent in 1967 to comprising thirty-four SA-2 and SA-3 batteries,

twelve SA-6 batteries, 500 SA-7 launchers, and more than 900 guns. Of the forty-six total

SAM batteries in Syria, twenty-five were in the Golan Heights and Damascus area.[17]

Many of the SAMs were operated by experienced Soviet personnel.[18]

This environment was perhaps the first in history that resembled the IADS faced

today, albeit in a simpler form. The problem was not the individual systems, but rather

the integrated and overlapping fields of fire of these systems (IAF personnel sometimes

referred to these mutually supporting batteries as "super-batteries"). Even during

Vietnam, the USAF only dealt with early model SA-2s and anti-aircraft artillery. The IAF

faced a major challenge in contending with this dense air defense situation.

In the short term, the IAF created a diverse set of increasingly complex plans,

usually made at the IAF Operations Branch, usually attempting to outwit SAM operators.

The IAF debated means to mitigate the SAM threat in the longer term, focusing on the

"electronics versus physics" argument. At IAF headquarters, Joseph Na'or led the

electronics side. His team was able to rebuild American jamming systems designed for

use against Vietnamese SA-2s to work against both SA-2s and SA-3s. However, by the

time the war began in 1973 there was no data regarding SA-6s so the pod was completely

ineffective against that missile system.[19] In contrast, the "physics" side of the debate was

led by the commander of 171 Squadron, Iftach Spector.

Spector advocated defeating the SAMs by remaining unpredictable and

minimizing the attacking fighters' exposure time. In the months prior to the 1973 war,

Spector codified his unit's tactics into what they termed "hunt" tactics.[20] He began to

train other squadrons on these tactics, but they were still nascent when the war began.

The 1973 war began with an attack by Egyptian and Syrian forces against Israeli defenses on 6 October 1973. IAF commander Major General Binyamin Peled ordered the execution of Operation Model V against Syrian air defenses for 1100 on 6 October, a full three hours before the Arabs commenced hostilities.[21] Political considerations, however, led Prime Minister Golda Meir's to choose not to preemptively attack.[22] The opening stages of the war should not necessarily be viewed through a lens of how much surprise the Arabs achieved, but instead through the lens of prewar preparations and plans.

Plans and Preparations

The Egyptian plan, Operation Badhr, intended to regain the Sinai for Egypt by denying victory to the Israelis as opposed to defeating the IDF outright. The plan was essentially to cross the Suez Canal, destroy the Bar-Lev Line, and hold the east bank of the Canal with entrenched anti-tank forces under a dense ADA umbrella until a ceasefire could be brokered.[23] This plan denied the two great Israeli military strengths: tanks and planes. See Figure 17 below for an illustration of the Egyptian plan. The Syrian plan was more aggressive.
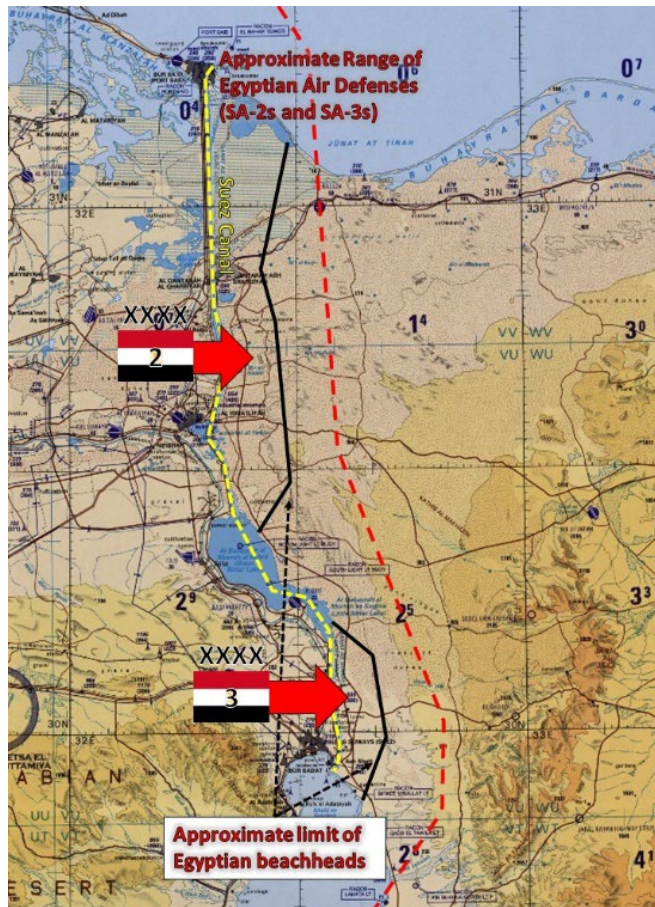
Figure 17. Egyptian Operational Scheme

Source: Created by author.

The Syrian plan, Operation Al-Owda, aimed to set conditions for an invasion into northern Israel. The Syrians planned to attack along the entire border but with an emphasis on the southern axis. The goal was to reach the River Jordan within just 36 hours.[24] The plan relied upon speed and mass to overwhelm the Israeli defenders and storm into Israel before reserves could arrive. The Syrians also faced notably more difficult terrain than the Egyptians: a steep slope up to the Israeli Purple Line and more urban areas. See Figure 18 below.
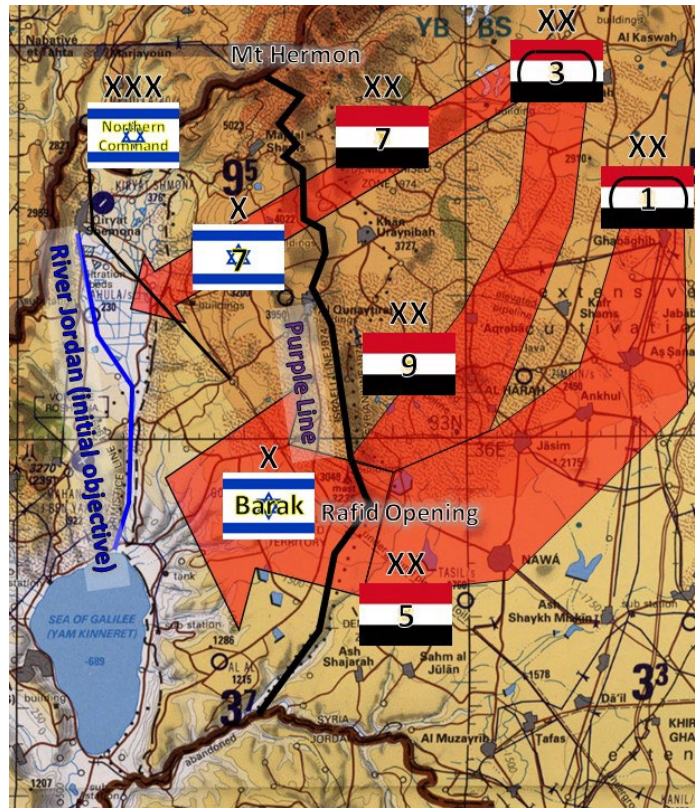
Figure 18. Syrian Operational Scheme

Source: Created by author.

The IDF perceived that the increased depth provided by the occupation of the Sinai and the Golan Heights improved the feasibility of their model.[25] However, the dearth of artillery and infantry meant the IDF was ill-prepared to defend either the Purple Line or dislodge Egyptian infantry from the east bank of the Canal. The significant overmatch the Arabs presented in ground forces exacerbated the Israeli weaknesses. See Table 5 below for a comparison of Arab and Israeli forces on 6 October 1973 on both fronts. This quantitative weakness forced the IAF to commit its air forces to disrupting the Arab ground forces prior to attaining even a semblance of air superiority.

Table 5. Arab and Israeli Forces, 6 October 1973			
Ground Forces			
Israel (pre-mobilization)	**Ground Force Type**	**Arab State**	
Sinai		**Egypt**	
8,000 (<600 in Bar Lev Line)	Troops	100,000+	
280	Armor	1,600+	
60	Major Artillery (155-mm+)	2,000+	
Golan Heights		**Syria (and allies)**	
7,500	Troops	70,000	
181	Armor	950	
50	Major Artillery (155-mm+)	700	
Aircraft and Air Defense Strengths			
Type	**Israel**	**Egypt**	**Syria**
Fighters	354	472	229
Bombers	0	26	0
Reconnaissance	19*	18	4
SA-2/3 Fixed Radar Batteries	-	140	22
SA-6 Mobile Radar Batteries	-	10	15
SA-7 Man-Portable Launchers	-	366	120
Anti-Aircraft Guns	819	1,612	694
* Includes 10 BQM-34 Firebee drones and one EC-97G electronic warfare platform. NOTE 1: During the war, Arab SAMs fired approximately 2,000-3,000 radar-guided SAMs and an additional 5,000 SA-7s. NOTE 2: The Israelis possessed 10 HAWK radar SAM batteries not listed.			

Sources: Chaim Herzog, *The Arab-Israeli Wars* (New York, NY: Vintage Books, 2004), 239-240, 243; Central Intelligence Agency, Directorate of Intelligence, *The 1973 Arab-Israeli War: Overview and Analysis of the Conflict* (Washington, DC, 1975); J. R. Transue, ed., *Assessment of the Weapons and Tactics Used in the October 1973 Middle East War*, WSEG Report 249, IDA Report R-205 (Arlington, VA: Institute for Defense Analyses, 1974), 44, 76.

The IAF expected to conduct large-scale mass raids against airfields and ADA targets for at least a day in order to establish air superiority within the battlespaces. Indeed, nine hours prior to the Arab attack the IAF was preparing to execute Operation Model V against Syrian ADA.[26] Once the dual Egyptian-Syrian attack commenced—a

strategic move the Israeli did not expect until too late to update the plans—the IAF

commenced the first wave of Operation Challenge, targeting Egyptian SAMs and

airfields.[27] The rigidity of the IAF's complex, centrally developed plans as well as the

inability of the ground forces to allow the IAF to focus its forces on the Arab ADA soon

caused major problems for the Israeli air maneuver.

The War on the Golan Heights

The initial Syrian attack commenced at 1355 along the entire border with

coordinated artillery, rocket, and surface-to-surface missile barrages striking Israeli

defenses as well as a major air attack against the Golan and northern Israel. Israeli

defenses mostly held in the north, although the IDF lost a critical outpost atop Mount

Hermon. However, the main Syrian force broke through the lines of the 188th (Barak)

Brigade in the south. By noon on 7 October, the southern Syrian forces penetrated about

halfway to Jordan River. While the Israelis rushed to send still mobilizing reserves to

hold the line, the IDF General Staff ordered the IAF to shift its emphasis from the Sinai

to stem the Syrian advance.

The IDF General Staff considered Egypt to be Israel's most potent adversary and

therefore the Sinai to be the more important front. However, the situation on the Golan

over the night of 6-7 October forced a reevaluation. Defense Minister Moshe Dayan

visited the Northern Command headquarters and shortly thereafter ordered the IAF to

commit its forces to the Golan, despite the fact that the first wave of Challenge (against

the Egyptian IADS) was already fighting.[28] At 1130, the complex first wave of Model V

failed. The IAF launched 120 aircraft, losing six F-4 Phantoms and suffering battle

damage to a further ten to only destroy a single SAM battery.[29] Losses were

exceptionally high since electronic jamming gear was positioned in the Sinai and could not get to the Golan in time for the attack. Of note during this attack, Spector's 171 Squadron was the only formation that did not lose an aircraft, likely due to Spector's demand to alter the tactical plan dictated by IAF Operations Branch.[30] The Syrians moved the bulk of their SAM batteries from the positions identified in the Israeli plan and the lethal environment prohibited searches by the fighter pilots. Nevertheless, the IAF conducted numerous attacks against the Syrian ground forces before the Model V attack at 1130 and continued after the failure.

On 6 October, Peled sent retired IAF general Mordechai Hod to the Northern Command CP to act as an air liaison. After Dayan's visit there, Peled gave Hod direct control of one A-4 squadron from Ramat David airfield to help stem the Syrian tide. IAF units, under Hod's guidance, continuously flew into the southern Golan area to stop the Syrian advance.[31] While the IAF suffered heavy losses (13 aircraft), Northern Command cited these attacks as the primary cause for the Syrian halt on 7 Octber, just four miles short of the Jordan River.[32] Land forces attempted to aid the air maneuver through fires during this critical time. Many of the long-range artillery units recently mobilized were put into action against Syrian SAM batteries.[33] Air maneuver reduced Syrian capabilities to the point that the remnants of the Barak Brigade and the arriving reserves were able to re-establish an Israeli front.

Between 8 and 10 October, Israeli reserves arrived and slowly pushed the Syrians back to the Purple Line. The Syrians fired so many SA-6 missiles (estimates vary from 800 to 2,000) on 6 and 7 October that sometime on 8 October, the Israelis assessed the Syrian missileers were out of SA-6 missiles.[34] Additionally, IAF strategic attacks against

targets deep in Syria, from the areas north of Damascus all the way to Ladakia, caused the Syrians to pull some of their air defenses back to Damascus.[35] See Figure 19 below for an illustration of Israeli land and air maneuver between 8 and 10 October. By 10 October, the IDF stabilized the situation on the Golan and elected to attack into Syria.
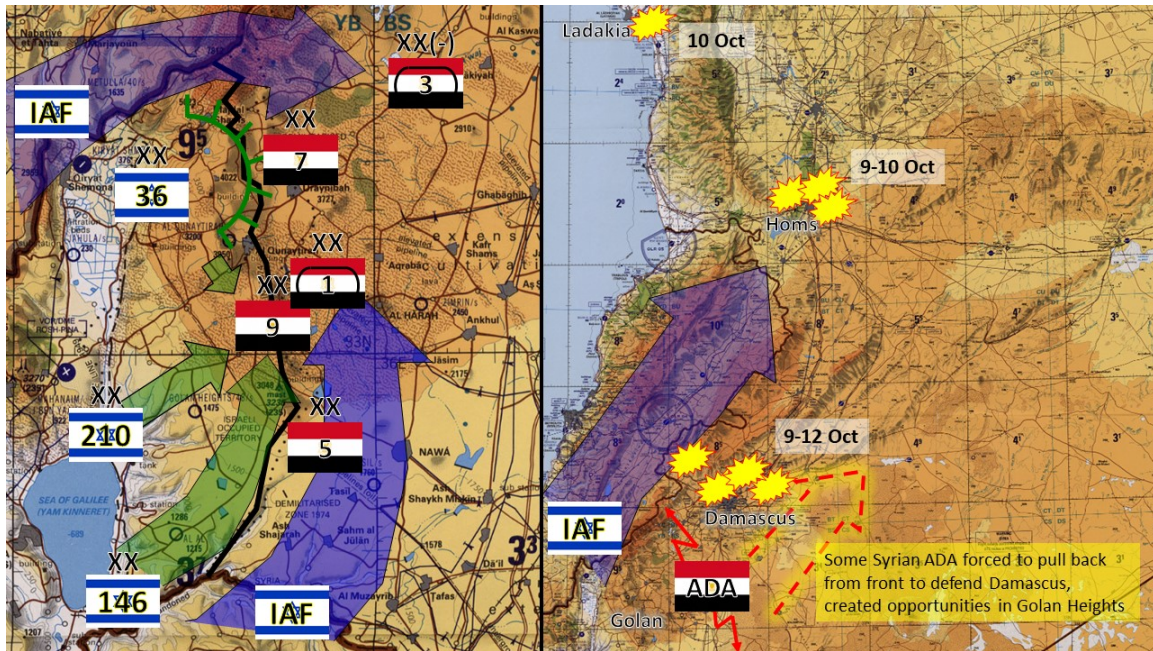
Figure 19. Maneuver in the Golan and Syria, 8-10 October 1973

Source: Created by author.

IAF fighters conducting AI supported the ground advance. During this operation, Syrian supply shortages and attrition coupled with increased Israeli artillery and electronic warfare assets enabled the IAF to neutralize the remaining Syrian ADA.[36] Despite the offensive, the IAF allocated only 23% of its strike sorties to the Syrian front between 11 and 23 October.[37] By 14 October, the lines stabilized and the IDF largely held their foothold while the majority of Israeli resources were committed to the Sinai.

The War along the Canal

Israeli national and military leadership perceived the Sinai front as the more important of the two fronts. With only a few exceptions, the southern front received the bulk of Israeli reserve ground forces as well as the main weight of the IAF's efforts (75% of all IAF sorties during the war).[38] Despite the urgency in the first several hours, the Israelis largely stabilized the Golan front by the evening of 7 October and had re-established the border by 10 October. In contrast, the situation in the Sinai was much more dynamic.

As discussed previously, the Egyptians created a plan that expertly neutralized Israeli strengths (airpower and armor) while setting conditions for successful negotiations. Beginning at 1405 on 6 October, Egyptian forces rapidly overwhelmed most Israeli resistance on the east bank of the Suez Canal, establishing defensive positions around their bridgeheads to resist the inevitable Israeli armored counterattack.[39]

The Israeli counterattacks during the first two days were characterized by massed armor with virtually no other combat arms, including minimal IAF support.[40] The IAF was unable to penetrate the Egyptian IADS and the IDF land forces were unable to crack the infantry-based bridgeheads. Unfortunately for the Egyptians, the crumbling Syrian front provided the Israelis an opening.

On 14 October, in an effort to alleviate Israel's pressure on the Golan, the Egyptian 4th Armored Division attacked east from the canal towards the mountain passes leading into the Sinai interior.[41] The Israelis were able to set up effective defensive positions in the Mitla and Giddi passes as well as west of Bir Gafgaga. The IAF was able to unleash significant firepower on the attacking Egyptians, finally out from under their

protective SAM cover. See Figure 20 below illustrating the long open terrain the Egyptians needed to cross outside their SAM umbrella.

Figure 20. Distances between the Egyptian IADS and the Corridors into the Sinai

Source: Created by author.

Israel decisively defeated the attack. Several Egyptian armored brigades were decimated, including one near the Mitla Pass which lost nearly two-thirds of its strength.[42] One should note, however, that the Egyptians perceived this battle as a

success since it achieved a strategic purpose by focusing Israeli leadership (and IAF operations) on the Sinai, away from the Golan.[43] However, the victory was vital in restoring Israeli morale.

At 0030 on 15 October, just hours after the Egyptians turned back west, the Israelis decided to attack across the Canal. After a couple days of heavy fighting, the Israelis had a secure foothold on the west side of the canal. Importantly, IDF ground forces destroyed a number of Egyptian SAMs, opening a hole in the Egyptian IADS. Indeed, Colonel Haim Erez's raid on 15-16 October—the first Israeli foray west of the Canal—was intended to destroy SAM sites and neutralized three sites (probably SA-2 or -3 sites) prior to returning to the bridgehead.[44] The IAF was able to pour assets through this hole, slowly whittling away further SAMs. Egyptian efforts to plug the hole with fighters met with decisive defeat by Israeli pilots.[45] Over the remainder of the war, from 19-25 October, the Israeli ground forces worked to isolate the Egyptian 3rd Army and the city of Suez. With the Golan front relatively stable, the IAF was able to focus efforts on the Sinai, flying more than 2,700 strike sorties into Egypt (25% of all sorties in the entire war).[46] While the Israelis were unable to achieve the smashing victories reminiscent of earlier wars, the IAF successful disrupted and delayed Egyptian attacks on the northern and western Israeli flanks in addition to providing support against the Egyptian 3rd Army itself.[47] Ultimately, the Israelis established a powerful bargaining positioning but were unable to achieve the decisive victory they sought when the ceasefire went into effect on 25 October.

Effectiveness

The effectiveness of the airpower during the 1973 Arab-Israeli War is not easy to measure, especially given the difficulty in obtaining data from the Arab side. To assess effectiveness properly, one should remind oneself of the effects the Israelis desired from their air maneuver. The IAF had three major objectives that may be measured (some more precisely than others): the establishment of air superiority over both Israel and IDF land forces; the disruption of attacking Arab forces to buy time for mobilization; setting conditions for successful counterattacks through interdiction.

In the first case, the IAF performed moderately well. Although Arab air attacks occurred throughout the war, especially during the early stages, they were usually intercepted. The Arab pilots that succeeded in attacking targets often produced minimal results.[48] The IDF's inability to establish air superiority over the battlefields, however, significantly impacted execution of the other two missions in the opening days.

On the Syrian front, air maneuver succeeded in disrupting the Arab ground attack. The IAF's attacks, especially on 7 October, played a significant role in halting the Syrian attack, albeit with heavy losses. While the Israeli aircraft were not very successful at destroying tanks (an assessment team reported that the only three Arab tanks showed evidence of air strikes), the IAF proved adept at interdicting supply lines and less armored targets.[49] More than 25% of the Syrian tanks found in the Golan were actually found with no damage whatsoever; their crews abandoned them when they ran out of fuel.[50] Since the data suggests that the IAF successfully interdicted supply lines to forward Syrian forces, it is reasonable to assume that at least some tanks ran out of fuel or ammunition and were subsequently destroyed by Israeli land forces, skewing the assessment team's data.

The Israeli integration of air and land maneuver on the northern front can therefore be deemed successful in the defensive stage of the battle but less so during the offensive into Syria. The IAF succeeded in disrupting the Syrian attack, buying time for the IDF ground forces to mobilize. The IAF sufficiently pressured the Syrian forces to enable successful land maneuver to retake the Golan Heights. When the Israelis launched their offensive towards Damascus, the IAF, focused now on the Sinai, was unable to set conditions for a successful counterattack.

The lack of terrain to hide behind as well as the denser air defenses in the Sinai severely curtailed IAF effectiveness during the early portions of the war. While Air Force leaders understood the threat of the Egyptian air defenses, it does not seem that there was much consideration to mitigating those threats through any means other than sustained attack by fighters. Coupled with Egyptian defensive tactics, the IAF was neither able to disrupt or delay attacking Egyptian forces nor could the IAF interdict follow-on Egyptian troops.

Israeli operational theory relied upon the Arabs to continue advancing during the first stage of the operation. When the Egyptians stopped their advance and secured their bridgeheads, the IAF could not attack the bridgeheads or the Egyptian supply lines without prohibitive losses. Attacks against the bridges themselves met with mixed results but likely produced at least some logistical problems for the Egyptians beginning in the evening of 7 October.[51] Therefore between 6 and 14 October the IAF sent many aircraft on attack missions to the Sinai but delivered only negligible results either by themselves or through enabling land maneuver.

The IAF and Israeli armor delivered a devastating defeat to Egyptian forces during the Egyptian attack towards the Gidi and Mitla Passes on 14 October. This set conditions for the successful Israeli crossing of the Canal. Once the land forces opened a hole in the Egyptian IADS on the west bank, the IAF had a toehold across the Canal. The IAF used that opening to both whittle away at the remaining air defenses as well as conduct an interdiction campaign in Egypt itself. Ultimately, the air and land integration in the Sinai was effective in that the IAF eventually achieved the objectives set out for it. Interestingly, though, and discussed in detail later, airpower required land maneuver (destruction of Egyptian SAMs by Israeli armor) to enable its success.

Command and Control

The Israeli operational C2 structure was reminiscent of the German structure during World War II. In both the German and Israeli systems, doctrine emphasized rapid, decisive victory through airpower and armored forces (although the Israeli system overemphasized armor). Both systems gave maximum freedom to individual services by only creating organizational links at the highest levels of the military. The IDF General Staff, guided by the Defense Minister, directed the services and the geographic commands. The geographic commands—Northern, Central, and Southern—maintained OPCON of land forces and requested effects from other services through the General Staff. Thus, each command conducted land operations within its area, but the General Staff coordinated operations in all other domains.

The Israeli system emphasized independence of air and land maneuver to a rather extreme degree. While the IAF received information from the land forces to facilitate air operations, the primary IAF mission, AI, was typically coordinated at the General Staff

level. The General Staff provided broad apportionment guidance to the IAF which the IAF staff, primarily the IAF Operations Branch, used to generate specific apportionment and allocation decisions. The best example of this was the tumultuous events of 7 October.

On that day, as Meir, Dayan, and Chief of the General Staff David Elazar came to grips with the situation on both fronts, the leaders pushed the IAF between the Sinai, Golan, and back. Late on 6 October, the IAF directed efforts for the morning against the Egyptians. At about 0700 on 7 October, Dayan and Elazar directed the IAF to put maximum effort to interdicting the Syrians. Shortly after noon, Dayan and Elazar redirected the IAF back towards the Sinai.[52] At each change, the IAF Operations Branch reapportioned and reallocated missions based on a combination of prewar plans and the perceived situation.

IAF's Operations Branch fulfilled duties somewhat commensurate with a modern US AOC's Strategy Division and Combat Plans Division. However, in many ways because of the IAF's infatuation with intricate plans after the Six Day War, Operations Branch also created the tactical plans for the squadrons to execute. Analysis of Israeli pilot reports suggest that since they were flying so many sorties per day, they typically simply received a complete mission plan either a relatively short time before walking out to their aircraft or sometimes even while sitting in their cockpits. This is not to say that the Israelis were tactically rigid, quite the contrary. Rather, the almost extreme flexibility with which pilots employed their formations and aircraft was often undertaken at considerable risk. Deviations from the centralized plan could result in major deconfliction risks or the loss of mission-enabling assets like escort. The fact that pilots' deviations did

not cause too many major issues is a testament not to flexible planning but instead to the significant tactical acumen of Israeli aviators.

While information regarding the precise structure of Operations Branch is difficult to find (although it is likely available at the IDF archives in Tel Aviv), the main office was the Strike Planning Office which worked closely with the Strategic Bombing and Anti-Missile Office. These offices produced the bulk of the plans the IAF executed. Another third office, the Photo-Reconnaissance, Ground Support, and Special Operations Office received air support requests and integrating them into the next day's plan. One should note that since the IAF prior to the 1973 war made minimal effort to conduct CAS, the Strike Planning office handled AI planning while the Ground Support office was only responsible for CAS.[53]

The C2 structure on 6 October relied upon the IDF General Staff possessing a reasonably accurate operational picture so that IDF Operations could provide IAF Operations with prudent guidance for the allocation of resources the next day. While it was possible to shift air assets immediately prior to or during execution, it seems that this was an *in extremis* procedure based on the centralized planning paradigm the IAF used. Regional air liaison officer, working with command artillery officers, produced air support requests, the primary mechanism for integrating air and land power. The command fires personnel prioritized requests and sent them to IDF General Staff, who prioritized them again. Once complete, the General Staff sent the prioritized target list to IAF Operations Branch for planning. IAF Operations then sent the next day's plans and targets out to the various bases. Of note, IAF bases operated in much the same manner as USAF wings (i.e., IAF base X commanded the squadrons stationed there, similar to the

way USAF wing Y commands the squadrons assigned or attached to it). See Figure 21 below for an illustration of this C2 structure. This system ensured that airpower could not be responsive to joint needs without significant knowledge and initiative on the part of aircrew.
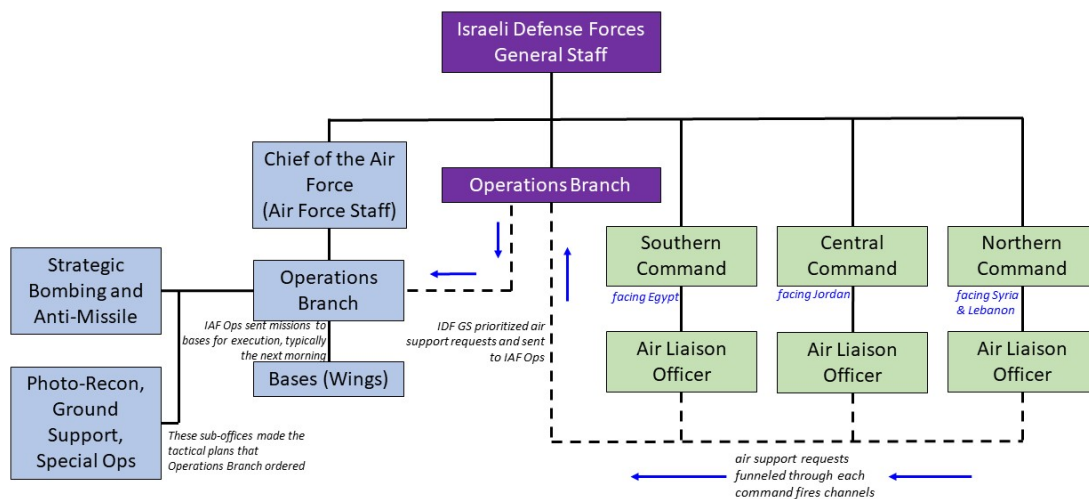
Figure 21. Israeli Operational Command and Control System

Source: Created by author.

In earlier wars, this lack of responsiveness was not a significant problem. This was due in no small part to the fact that the IAF enjoyed air superiority over the battlefields prior to 1970. Pilots were able to fly over a potential target area long enough to discern friendly from enemy. "In every past war, IAF squadrons had used their own pilots' observations to assemble 'living maps' of the front that were far more detailed and accurate than anything [IDF military intelligence] could provide, while IDF senior

commanders routinely trooped to the IAF bunker underneath Tel Aviv to find out what things were like at the front."[54] In 1973, the Arab IADS made such actions impossible. Air defenses forced IAF pilots to fly low altitude tactics. Pilots ingressed to known target areas at extremely low altitudes. Once they reached a certain distance from the target, they climbed to several thousand feet above the ground. If the target was not there, they either struck something that appeared worthwhile or egressed the area. In either case, there was no ability to loiter or determine the ground situation.[55] The 1973 situation, therefore, required the C2 system to positively update and control airpower both before and during sorties.

The 1973 war forced the Israelis to create a system for more integrated air-land operations. On 10 October, the Oded Marom (commander of 101 Squadron flying Mirage IIIs until that day) replaced head of the ground support office. Marom demanded and received better communications systems, more personnel, and, eventually, a myriad of liaison officers. In the course of just a few days, Marom built an organization that looked remarkably like a modern US Air Support Operations Center. In fact, Marom referred to it as the "Center for Air Support."[56] See Figure 22 below for a diagram describing Marom's organization.
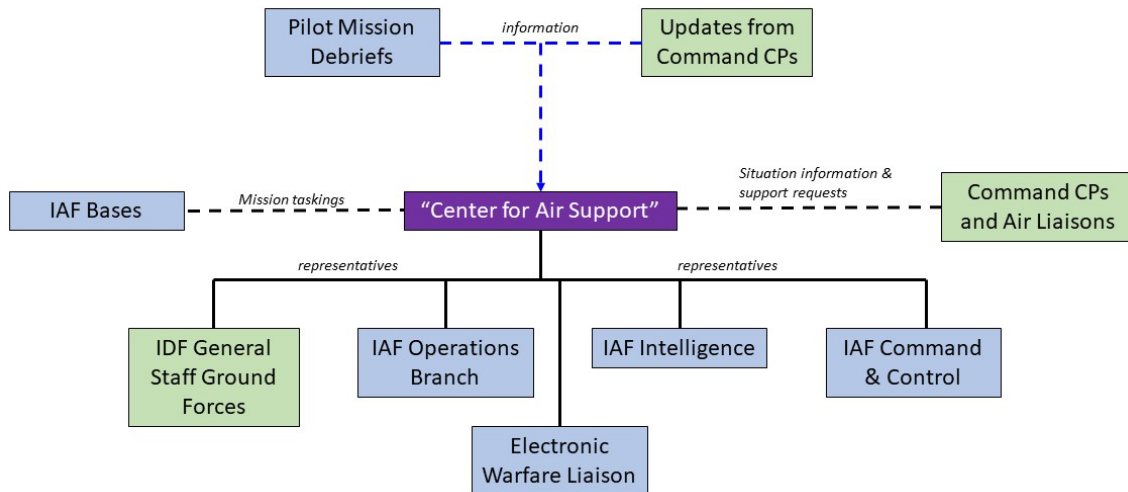
Figure 22. Oded Marom's "Center for Air Support"

Source: Created by author.

He ensured that his office possessed the liaisons needed to coordinate with both the IAF and the regional commands to maintain up-to-date information on the battlespace including what effects were needed where. He was able to incorporate this knowledge into the following days operations through the IAF Operations Branch as well as update pilots that same day through liaisons with the IAF's tactical C2 network. See Figure 23 below for an illustration of the Israeli C2 system after Marom implemented his model. Using this system, the IAF created a tactical risk mitigation system intended to allow maximum freedom of action for aircraft.
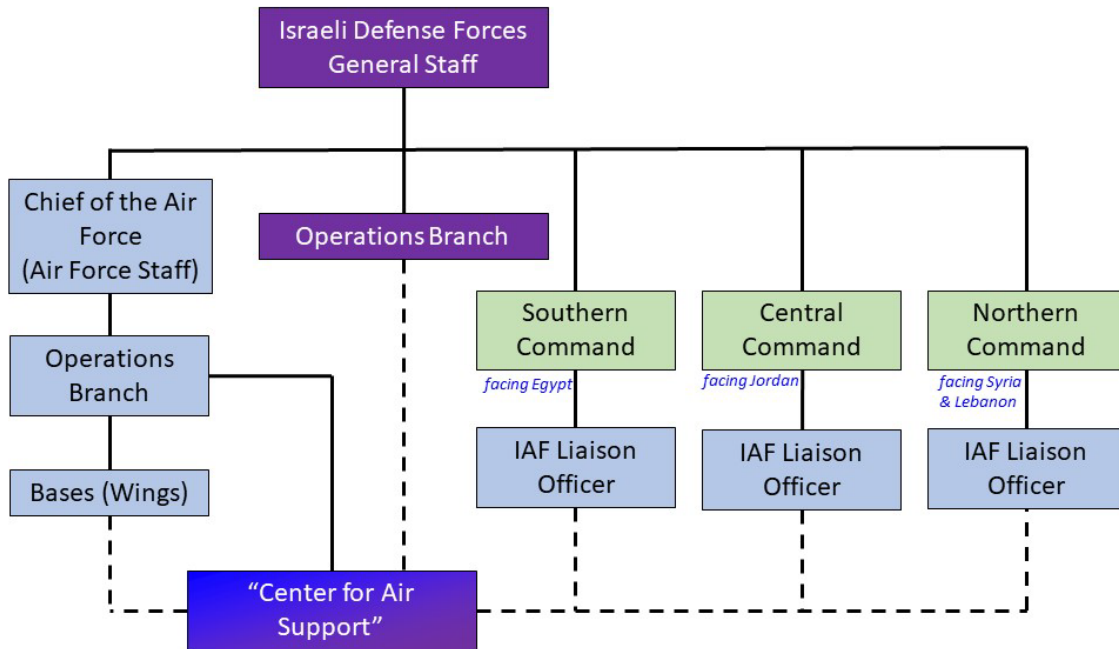
Figure 23. Israeli Operational C2 Structure at the End of the 1973 War

Source: Created by author.

With the reasonably accurate information available, the IAF established a "line of secure bombing" within a few kilometers of friendly positions. Beyond this line, IAF pilots attacked targets at will. As the IAF engaged targets closer to friendly positions, certain restrictions reduced the risk of fratricide. Targets short of the line required target correlation with a forward air controller (often an artillery officer but increasingly IAF pilots). Once targets were inside one kilometer of friendly positions, ordnance restrictions were increasingly strict until 200 meters. Inside this distance, aircraft were not authorized to strike. Additionally, artillery was not allowed to fire while aircraft were operating in the area without the approval of the controller.[57] While there was undoubtedly room for improvement, Marom essentially created a system for the IDF to integrate air and land

maneuver. Marom's center represented one of two notable changes the IAF made in an effort to make its operational C2 more flexible.

Improvements to the IAF's planning and tactical C2 system were the second major adjustment. The system the Israeli began the war was highly centralized (similar in many respects to the current US model). IAF Operations, working from a command bunker in Tel Aviv known as "the Pit" or "the Hole," received guidance from the IDF General Staff concerning apportionment.[58] They then turned that guidance into specific missions and sorties in a process likely somewhat akin to the US ATO development process. Individual bases received the taskings, after which the base command distributed the missions to the base's squadrons. If a mission demanded flights from multiple bases, IAF Operations planned the entirety of the mission.[59] The IAF used this model during the Six Day War and it remained largely unchanged moving into the 1973 war.

The rapidly changing conditions during the war coupled with a requirement to quickly deliver effects required by the land forces led to decentralization process within the IAF. The Operations Branch quickly pushed tactical mission planning down to the base level (and bases sometimes delegated planning further to squadrons). This change was not necessarily advocated for by IAF Operations personnel but demanded by front-line pilots.[60] Further facilitating lower level planning, Marom's air support center enabled improved and more direct communication between aircrew and land forces. Coupled with improved communications abilities between both the air support center as well as the regional command posts, pilots were able to receive more current information in flight concerning both the friendly situation as well as targeting information and

desired effects. As a result, Israel's system was simpler and more flexible than at the start of the conflict.

<div align="center">Analysis of the Israeli System</div>

The 1973 Arab-Israeli War presented excellent lessons regarding the integration of airpower and land power. More specifically, the Israeli system illustrates four important themes, most of which are found in the German and Soviet Union examples as well: the requirement for effective C2 structures to facilitate integration, the benefits of viewing airpower as a maneuver force, the mutually enabling nature of airpower and land power, and the necessity of cross-domain tactical enabling effects. Israel's shortcomings in these areas contributed to an overall difficulty in the IDF's ability to establish temo.

Israel's C2 system failed in two critical ways. The system could not feed accurate information to the General Staff, inhibiting resource apportionment (especially airpower). The system was also incapable of providing accurate and timely information to airborne assets regarding the ground situation including desired effects or targets. Both issues were related but the first problem was a more pressing concern.

The IDF system rested upon the idea that the IAF could generate sufficient friendly information and enemy intelligence to build a reasonably accurate picture of the battlespace for the General Staff. To a large degree this allowed the Israeli C2 system to continue underdeveloped for many years. When this assumption was made false in 1973, the C2 system needed to be reformed to pass accurate information back and forth between the regional commands and the General Staff. To Modem's credit, the center for air support met this requirement, albeit late in the war. The center also permitted transmitting timely information to aircrew both before and during missions. Based on the

liaisons present at the center, the information passed was likely an amalgamation of previous pilots' reports as well as reports from liaisons at the regional commands. While part of these reforms included providing terminal attack control in some circumstances, in most situations the Israelis managed the IAF as a maneuver force.

The C2 system was poorly designed for land forces to nominate individual targets (i.e. "that tank" or "that artillery battery") although major targets such as bridges or large units could be designated. Instead, the system was very well suited to assign missions to the IAF. As an example, during the both the 1967 and 1973 wars, the General Staff directed the IAF to interdict the Mitla and Gidi Passes to enable successful land action (an area defense in 1973). Another example was the General Staff directive to the IAF to halt the Syrian advance through the Rafid Opening on 7 October 1973—a mission, not a target. This method of synchronization between air and land forces was closer to what we today would term mission-type or effects-based orders. The IAF received an objective, then was largely left to its own devices to accomplish that mission. In general, the IAF enjoyed considerable success in setting its own tempo and achieving the objectives set before it. While the IAF traditionally accomplished its missions without ground support, the war in the Sinai highlighted the fact that airpower and land power are mutually enabling.

In the Sinai, the IAF was ineffective at creating conditions for a successful Israeli counterattack. While Israeli fighters destroyed some Egyptian bridges, the Egyptian bridgeheads remained intact and reasonable well-supplied. The IAF only produced the deadly results the Israelis were accustomed to when the Egyptians left the safety of their missile umbrella and attacked towards the Sinai passes on 14 October. However, once the

IDF was able to force their way across the Suez, Israeli tanks destroyed SAM batteries, opening a hole in the Egyptian IADS. The IAF exploited this gap to establish air superiority over at least the southern portion of the Suez Canal. Land maneuver by several Israeli divisions and brigades opened the door into the Egyptian air defenses, thus enabling Israeli air maneuver. In a reversal of roles, Israeli ground forces set conditions for the IAF to conduct air maneuver. The IDF's poor preparation to contend with the Arab's IADS required this role reversal.

The Israeli system worked well during the Six Day War and earlier predominantly because the IAF enjoyed air supremacy. Air supremacy allowed the Israeli pilots to loiter over or near battlefields to observe, orient, and decide how to act. When these same pilots returned to their base, they were able to update both the next wave of pilots as well as send their information to "the Hole." Prior to 1973, the Israeli system was able to execute at a rapid operational and tactical tempo thanks to the freedom the system provided the IAF. The Arab ground-based air defenses fundamentally altered the paradigm.

While the Arab air defenses were a known issue to the IAF, the IDF did not address the ramifications of that defensive system. The IDF's doctrinal foundation rested upon the IAF's ability to disrupt an Arab attack while reserves mobilized. The situation in October 1973 did not allow the IAF the time they needed to conduct an air superiority campaign. IAF tactical thought relied upon air superiority prior to commencing major attacks against ground forces. As a result, the IAF did not possess significant tactical capabilities to mitigate threats while attacking enemy fielded forces. The IDF's failure to either create joint solutions to the SAM problem or to adjust their operational theory to account for decreased IAF effects on land maneuver represented a notable failing on the

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part of IDF leaders prior to the war. Given that the ground forces mobilization timetable was already as rapid as possible, the IDF should have sought a joint, cross-domain solution to the SAM problem.

The IAF did not possess a reasonable solution to the layered SAM network by itself. While the IAF learned some techniques to deal with SA-2s and SA-3s during the War of Attrition, the Israelis (and the USAF for that matter) did not know how to mitigate the lethal SA-6s. While the IAF eventually employed electronic warfare assets to suppress the radar-guided SAMs, these systems were scarce in the critical opening days. It is noteworthy that the IAF seemed to focus almost exclusively on finding either an electronic or tactical solution to this issue without considering a joint solution. Given the importance of the IAF within the Israeli defense community, it is likely that an air force request for long-range artillery or ground-based electronic warfare platforms for air defense suppression might have been approved. Regardless, the heavy losses suffered by the IAF in the first few days of the war highlight the dangers associated with employing airpower in a counterland role without sufficient enabling assets.

The Israeli system therefore reflected a structure based on theory that did not fully account for the reality of their operational environment. The assumption by the IDF that the IAF would buy time for mobilization did not account for the IAF's presumption that it could have one or two days to defeat its adversaries' IADS. This error was compounded by the dearth of assets that could enable air maneuver (SEAD, whether air-based, land-based, or electronic). The Israeli system illustrated the issues that can arise when the C2 links between land and air forces are weak or inflexible. However, the system also demonstrated the strength of treating airpower as a maneuver force. Perhaps

most importantly, the conditions on both fronts illustrated well the concept that the

relationship between airpower is not always one-sided. While airpower often enables land

maneuver, in the right context land power enables air maneuver.

Table 6. Summary of the Israeli System	
Principles	
- Purpose of air and land maneuver is to decisively defeat adversary in minimal time to set conditions for successful peace negotiations - Airpower buys time through disruption of attacking forces to enable reserve mobilization - Once reserves mobilized, airpower enables decisive counterattack through interdiction - Airpower best employed via highly centralized control coupled with considerable tactical initiative	
Pros	**Cons**
- High degree of latitude to IAF yields high tactical tempo - Centralized control - Modem's "Center for Air Support" modeled an effective means to integrate air and land maneuver towards tactical objectives	- Poor operational C2 structure reduced ability of the <u>joint</u> system to observe-orient-decide - Overly centralized execution at first - Poorly integrated planning at operational level prior to war contributed to difficulties applying a course of action during first days
Analysis	
- C2 structure enabled initiative in air domain but required reform to ensure adequate information flow - Airpower viewed as a maneuver force - Airpower and land power mutually enabling – not one-way relationship - Lack of tactical enablers; IDF did not create joint solutions to IADS problem	

Source: Created by author.

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[6] Lon Nordeen, *Fighters Over Israel: The Story of the Israeli Air Force from the War of Independence to the Bekaa Valley* (New York, NY: Orion Books, 1979), 79.

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[12] George W. Gawrych, *The 1973 Arab-Israeli War: The Albatross of Decisive Victory*, Leavenworth Papers No. 21 (Washington, DC: US Army Center of Military History, 2004), 8.

[13] Rothenberg, 162.

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[17] Ibid.

[18] Yonay, 304.

[19] Ibid., 323-324.

[20] Ibid., 324-325.

[21] Dani Asher, ed., *Inside Israel's Northern Command: The Yom Kippur War on the Syrian Border* (Lexington, KY: University Press of Kentucky, 2016), 578.

[22] Gawrych, 27.

[23] Asher, *Egyptian Strategy*, 75-76.

[24] Herzog, 286-287.

[25] Ibid., 230.

[26] Asher, *Northern Command*, 581-582.

[27] Ibid.

[28] Ibid., 172-173.

[29] Ibid., 586.

[30] Yonay, 332-333.

[31] Asher, *Northern Command*, 586.

[32] Ibid.

[33] Ibid., 199.

[34] Cooling, 591.

[35] Nordeen, 133.

[36] Asher, *Northern Command*, 343-345.

[37] Central Intelligence Agency, Strategic Evaluation Center, *The 1973 Arab-Israeli War: Overview and Analysis of Conflict* (September 1975), 34.

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[39] Gawrych, 28.

[40] Martin van Creveld, *The Sword and the Olive: A Critical History of the Israeli Defense Force* (New York, NY: Public Affairs, 1998), 228.

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[53] Yonay, 343.

[54] Ibid., 343-344.

[55] Ibid., 340.

[56] Ibid., 350.

[57] Ervin J. Kis, "Techniques of Gaining Israeli Air Superiority in the 1973 War, better known as the 'Yom Kippur War'," *Academic and Applied Research in Military and Public Management Science* 7, no. 3 (Summer 2008): 417-418.

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[59] Yonay, 342.

[60] Ibid., 353.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

We have often mentioned the role of…tactical aircraft in the support of armoured attacks. But it can also work the other way round, with the operations of tank forces promoting the ends of aerial warfare…we do not have to be out-and-out disciples of Douhet to be persuaded of the great significance of air forces for a future war, and to go on from there to explore how success in the air could be exploited for ground warfare, which would in turn consolidate the aerial victory. *Here again it comes down to striving for a common victory, and looking beyond the interests of an individual arm of the service.* [emphasis added]
—Heinz Guderian, *Achtung-Panzer!*

Multi-domain formations possess the capacity, endurance, and capability to access and employ capabilities across all domains to pose multiple and compounding dilemmas on the adversary. Convergence achieves the rapid and continuous integration of all domains across time, space, and capabilities to overmatch the enemy. Underpinning these tenets are mission command and disciplined initiative at all warfighting echelons.
—US Army Training and Doctrine Command, *The U.S. Army in Multi-Domain Operations 2028*

After analyzing the structures and methods used to integrate airpower and land power in these historical contested environments, the degree of similarity between the different examples is striking. While there were strengths and weaknesses in each system—some more significant than others—they all operated under several basic precepts. To a large degree, these principles are prevalent in the extant USJF system. The conclusions that the US military should draw from this study are incremental changes and, more often, adoption of a mindset more conducive to large scale combat operations and MDO. There are six basic principles relating to the integration of airpower and land power that are recognizable in historical precedent: (1) trust is a prerequisite to any C2 system; (2) understanding of a common operational objective(s) is vital to trust; (3) operational and tactical C2 structures are the root of successful integration; (4) airpower

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should be treated as a maneuver force during large-scale combat; (5) airpower and land power are mutually enabling and mutually supporting; (6) contested air environments require well-integrated cross-domain tactical enablers (escort, SEAD, etc.) to conduct counterland or any other missions. While this thesis presents these principles from an air-land perspective, they seem to apply to integrating all domains. Table X below lists these principles for ease of reading and to ensure understanding.

Table 7.   Cross-Domain Principles
1. Trust is a prerequisite to any C2 system.
2. Understanding common objectives is vital to trust.
3. C2 structures are the root of effective integration between domains.
4. Airpower [all domain forces by exception] should be considered maneuver forces and not unnecessarily subordinated to the demands of another domain. "Supporting" and "Supported" roles are not conducive to multi-domain maneuver.
5. Airpower and land power [all domain forces] are mutually enabling and mutually supporting.
6. Contested environments require well-integrated cross-domain tactical enablers.

Source: Created by author.

Chris Fussell (one of Stanley McChrystal's close aides during his years leading the Joint Special Operations Command) emphasized that four key factors drive a large organization's ability to function with the speed and efficacy of small team: trust, common purpose, common understanding of the situation, and empowered execution.[1]

There are many similarities between Fussell's factors and the above list of principles, a fact that supports their validity. There are many Current US doctrine facilitates these principles in many ways. But, due to the operations of the 21st Century, the mindset of many officers does not always follow the precepts suggested by history or the intent laid forth in joint doctrine. Therefore, the largest focus area for development within the USJF pertaining to air-land integration is training, leadership, and education. Prior to delving deeper into these principles, a short discussion of the goal these principles seek to enable is warranted.

The US Army and USAF both recognize the increasing complexity of contemporary and future operating environments. The US Army's central concept to address this issue is MDO (discussed in Training and Doctrine Command Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*). The USAF's central idea is operational agility (presented in its September 2015 *Future Operating Concept*). In both cases, various tenets and facets describe the means by which the USJF will achieve strategic objectives during conflict: present multiple dilemmas to an adversary across all domains, with joint efforts converging on operational objectives that will result in strategic victory. To achieve this overall concept, effective integration between domains is critical.

Operational integration should be achieved through systems developed with principles derived from historical experiences in which air and land maneuver were effectively integrated in contested environments. Effective integration is a system in which the forces operating in each domain are provided the maximum freedom of action in which to exercise initiative and therefore establish the most rapid tempo possible in the

given environment. Rapid tempos created in each domain by mutually supporting and enabling domain forces guided by clear joint objectives greatly increase the odds of success for the USJF. See Figure 26 below for an illustration of this concept.
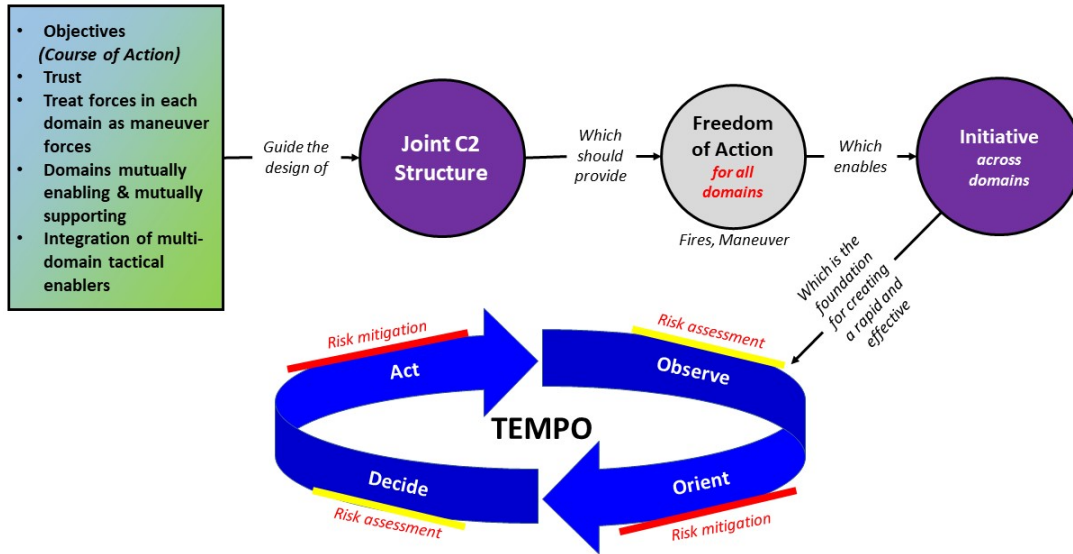
Figure 24. Principles to Tempo Model

Source: Created by author.

For ease of following the discussion, Table 8 below lists each principle as well as the areas this author believes the USJF should investigate for improvement. As noted previously, most of these areas for improvement deal not with doctrine, organization, or material and the like. Rather, they primarily focus on mindsets and perceptions which should largely be addressed through training, leadership, and education. These concepts rest on the core idea that the people operating in each domain trust one another to work towards a common objective.

Table 8.	List of Potential Improvements based on Cross-Domain Principles

1. Trust is a prerequisite to any C2 system.
  Improve the liaison system—liaisons require credibility and authority
2. Understanding common objectives is vital to trust.
  System must account for changing objectives during conflict
  Objectives should be effects-based, not target-based
3. C2 structures are the root of effective integration between domains.
  Create mindset that the mechanisms of integration are within C2
  Allow more flexible management of authorities within the air domain
4. Airpower [all domain forces by exception] should be considered maneuver forces during large-scale combat. "Supporting" and "Supported" roles are not conducive to multi-domain maneuver.
  Reactive nature of a fires asset means the USJF combat system will stagnate due to the friction of large-scale combat against a peer
  Mission-type approach based on treating airpower as a maneuver element eliminates this problem
5. Airpower and land power [all domain forces] are mutually enabling and mutually supporting.
  Mindset should be that airpower and land power continuously enable and support each other
Leaders must understand that, depending on context, any domain can be the USJF "weight of effort"
6. Contested environments require well-integrated cross-domain tactical enablers.
  Cross-domain enablers present enemy forces with multiple dilemmas, making it much more difficult to stymie maneuver in a domain

Source: Created by author.

<u>Trust</u>

Trust is vital in generating a culture in which initiative is allowed to thrive. In psychological terms, trust is one service's willingness to act based on confident expectations that another service will act in a certain way.[2] To build trust, each service should strive to build confidence in the other service that it will follow through on any promises. Higher level leaders must trust that the other services are working towards common objectives in the most appropriate fashions given their service capabilities. Trust

at this level allows the development of simple and streamlined C2 structures. At lower levels, trust enables the establishment of operational and tactical tempo in several ways such as trusting another domain to deliver a broad effect (like the German desire for VIII Air Corps to screen the flank of Panzergroup von Kleist). One area the USJF can improve trust between the air and land services is through improving liaison capabilities. Specifically, liaisons require credibility and authority.

Credibility and authority are the two factors the services should consider when selecting and educating liaisons. Liaisons achieve credibility through detailed knowledge of their service's capabilities and requirements. This knowledge should go beyond mere lists of asset capabilities. For example, an air liaison should understand the airspace and tactical enabling effects required in a given situation as well as be able to discuss the effects airpower could deliver. Authority is a more difficult challenge but vital to creating a sense within the opposite service that liaisons are trustworthy. The author's anecdotal evidence suggests that USA officers tend to lack trust in USAF liaisons because the Army officers perceive that the liaisons lack the authority to ensure that CAS assets appear as scheduled. This leads Army leaders to dismiss significant air planning because the USAF aircraft may not show up. These issues are discussed in more detail later, but when reviewing the three historical cases, readers should note that in each case liaisons possessed both credibility and authority.

The German and Israeli systems represented militaries in which a fair degree of trust existed between the air and land forces. Granted, the dysfunctional nature of German high command and the Luftwaffe's chief Hermann Göring was a large reason for the German structure which gave the Luftwaffe a high degree of autonomy. However,

operations in France and the first two years in the Soviet Union demonstrated that there was a high degree of trust at the lower levels. German generals worked well together in the field, coordinating their efforts without necessarily subordinating one domain to the other. German generals typically accomplished this based on personal connections rather than a formal C2 structure. Lessons learned during operations resulted in a continuously refined liaison system during the French and Russian campaigns to facilitate these personal relationships. Especially by virtue of the limited numbers of personnel involved as well as their direct links to their respective land and air headquarters, the liaisons possessed both credibility and authority.

Similarly, the Israeli system was based on enormous trust between the IAF and army. The army relied upon the IAF to provide the necessary mobilization time. Trust was demonstrated in a similar manner to the German system, although in the Israeli case the structural manifestation was truly based on trust between the air and land services as opposed to Göring's demands. At IDF headquarters, air and land forces communicated reasonably well. Modem's air support center streamlined that communication and ensured that information flowed both up and down the chain. Informal liaisons, exemplified by Moti Hod's work at Northern Command, further built trust between the services. Of note, both Modem and Hod possessed considerable authority despite not being within a designated chain of command for IAF assets. Modem's plans were largely implemented given his role within the IAF Operations Branch. During the first days of the war, Hod directly controlled an A-4 squadron, enabling him to directly fulfill any commitments he made to the IDF ground forces.

The Soviet system also displayed trust between the air and land arms although with subtly different causes and therefore discrepant analysis from the German or Israeli systems. Like the other two cases, by 1945 the Red Army liaison system was quite robust at the tactical level. The Soviet system was the only one in which land power subordinated airpower almost in its entirety. Red Army fronts, essentially army groups, controlled the majority of VVS strength. While Stavka and VVS headquarters were capable of shifting air armies from one front to another to mass effects, in the end the Soviet structure trusted the air service to deliver rather less than the other systems. However, the fact that air army leaders were part of the command team for a front as well as the fact that liaisons were usually air unit commanders or deputy commanders meant that liaisons possessed a great deal of credibility and authority. In short, the Soviet system did not display a lack of trust, but rather abrogated the need for trust between the services by subordinating airpower almost completely to land power.

Trust between the domains allows greater autonomy for domain forces. This freedom allows the air domain to set its own tempo, with commensurate effects on an enemy. The Soviet system represents the opposite of this idea. The Soviets denied airpower significant freedom, meaning it became a potent force in support of land power but did not help achieve larger aims or present dilemmas to the Germans outside of the immediate battle area. One should note that the danger with this freedom is disparate aims between the domains, causing forces to potentially create rapid tempos but without purpose. Common objectives and a sound C2 structure are vital to ensuring unity of effort. It is also interesting to note that operational and tactical trust are separate issues in many ways.

Tactical trust is whether members of one domain consider the other domain capable of delivering needed effects in a timely fashion with minimal impact on friendly operations (including risk of fratricide). High levels of trust enable tactical tempo through minimal control from one domain to another, like the IAF's attacks on the Syrian columns in southern Golan. Low levels of trust may significantly slow the tempo through lengthy control procedures placed on one domain by the other. While this sometimes may be necessary, especially in stability operations such as Operations Enduring Freedom or Iraqi Freedom, such an approach will lead to defeat in a contested large-scale combat situation. One should note that all three systems described, as well as the American system used during World War II and to a lesser degree during Operation Desert Storm fell into the high-trust, low control category as opposed to the alternative. The challenge for the USJF is how to build a system that generates trust between the services but recognizes the balance between control (risk mitigation) and tempo while being flexible enough to allow real-time adjustments.

Some characteristics of recent US experience coupled with service policies are potentially breaking down the trust between the USAF and the USA. There are two factors US leaders should consider to ensure that trust remains strong between the domain services. First, both the USAF and USA must critically evaluate their respective liaison systems to provide liaisons with credibility and authority. Second, especially considering the concept of a decisive space described in the USA's *Multi-Domain Operations 2028*, domain leaders should acknowledge the truth that both forces are fighting to achieve joint strategic and operational objectives—neither force is fighting merely to ensure the success of the other.

Both the USAF and USA must critically review their liaison systems to ensure that the liaisons are inspiring trust by educating liaisons to ensure credibility and developing doctrinal and organizational structures to give liaisons appropriate authority. A mindset shift within the services is required to addressed the credibility problem. The author's personal experience over the last five years suggests that the liaison culture within the USJF (both USAF and USA) is about determining ways for the air domain to facilitate the land domain by treating aircraft as reactive fires assets. This model is flawed because it inhibits credibility by generating a perception that a liaison's role is merely to advise a leader on specific tactical capabilities.

Instead, liaisons should focus on ensuring the ability for land and air forces to maneuver as effectively as possible towards the decisive space, defined by the Commander, Joint Task Force (CJTF). This emphasis means that This emphasis fundamentally alters the perspective of liaisons at brigades, divisions, corps, wings, Air Support Operations Centers (ASOCs), and Joint Air Operations Centers (JAOCs). At higher levels, such as the Battlefield Coordination Detachment and ASOC, liaisons should be working towards synchronizing the maneuver of the two domains as opposed to integrating tactical fires. Shifting the perceived role of liaisons in this way forces liaisons to focus less on requesting specific capabilities and more on building a holistic understanding of how the war is being waged by the forces they represent.

The holistic understanding liaisons must possess to be credible implies two main knowledge areas: the war plan for the liaison's domain (JAOP for an ALO, land component operations order for a Ground Liaison Officer (GLO), as well as situational changes) and the tactics, techniques, and procedures (TTPs) of task-organized forces. The

first topic allows a liaison to explain credibly what the service is doing to contribute to the campaign. While this may not prevent a commander's frustration at feeling unsupported, it will at least provide the facts regarding what the other service is doing and how it contributes to the JTF's efforts. The second subject is necessary for the liaison to be considered credible in delivering tactical effects. The liaison's knowledge must go far beyond simply knowing a specific weapon's effects. The liaison, or someone on the liaison's team, must understand the entirety of their service's execution requirements. As an example, an ALO should be able to help a ground unit's staff plan the battlespace framework (including airspace), facilitate needed tactical enablers such as target location assets or SEAD, and generally be able to meaningfully contribute to detailed mission planning and execution. All of this knowledge does not build trust, though, unless leaders believe that the liaison can actually deliver whatever is promised.

The planning timeline differentials between the USAF's ATO cycle and a typical Army division makes it exceedingly difficult for an ALO to integrate airpower in an Army plan. Usually, the ground plan is well into course of action analysis or approval before apportionment, allocation, and distribution of air assets is complete. This means that a ground plan will rarely, if ever, rely on airpower since the Army planners do not know if air assets will be available or not. Providing varying levels of authority to liaisons, at least the division and higher level, can mitigate this to some degree without appreciably altering either service's battle rhythms.

While further research and testing should be conducted, there are several ways of providing some authorities to higher level ALOs to build trust. One possibility is to temporarily provide a USA corps or division TACON of a USAF squadron. This could

be done for even a short period like a twelve-hour or twenty-four-hour window of time to avoid dividing airpower into "penny packets." The land unit could then ensure the aircraft are at the required time and place to facilitate the plan. Another possibility would be for the Joint Air Operations Center (JAOC) to "pre-approve" a certain number of flights on a given ATO day to the BCD prior to completion of the Master Air Attack Plan based on guidance in the JAOP and Air Operations Directive. This would allow distribution to occur earlier in the Army's Military Decision-Making Process, making it more likely that airpower is included in the land force's plan. Neither of these possibilities eliminates the chance that a CJTF priority might pull aircraft off of a CAS mission to conduct a strike in pursuit of JTF objectives.

<p style="text-align:center"><u>Common (Joint) Objectives</u></p>

Leaders must recognize that success in war is not often found in a single domain, but by all domains working towards common objectives. A shared understanding of objectives keeps forces operating in several domains moving towards the same purpose while allowing freedom of maneuver in their respective domains. Once the commanders in each domain clearly understand the goals the joint force is attempting to accomplish, they may conduct maneuver as they see fit to accomplish those objectives. This allows each domain to operate at the best tempo the forces in that domain can establish and sustain. While it may be relatively simple to establish clear operational objectives, creating a system that can account for changing objectives during conflict or communicating larger-scale tactical objectives can be problematic.

The current US Joint Task Force (JTF) model theoretically solves this issue through the doctrinal establishment of a CJTF. The CJTF sets operational and tactical

objectives and mission orders to component commanders as well as establishes support relationships to accomplish those objectives. The Soviet Union arguably demonstrated the best ability to establish common operational objectives between the air and land forces, but, as described earlier, did this by predominantly requiring air forces to limit themselves to facilitating the accomplishment of land objectives. While the Germans were able to do this as well, their system was less well designed to handle rapid tactical adjustments to those objectives.

Case Yellow in 1940 was an example of initial operational objectives clearly communicated to both air and land leaders by the OKW. However, the Wehrmacht initially poorly organized its tactical system, with minimal structure in place to define how the German Army and Luftwaffe would communicate. As a result, field army and air corps leaders usually created ad hoc arrangements to ensure objectives were aligned between domains. The shared perception of warfare between German leaders coupled with the trust based on that perception allowed German leaders to overcome the weaknesses in their C2 structure. Israel's system possessed the same structural weaknesses, but in the crucial first days of the 1973 war they dealt with a dilemma of their own making.

In the Israeli case, there was a fundamental disagreement in initial operational objectives (whether establishing air superiority or blunting the Arab attack) caused a degree of confusion at the operational and tactical levels as headquarters and air units repeatedly changed missions. In the end, direct intervention by Dayan and Elazar aligned Israeli objectives between the IAF and the IDF ground forces. The Soviet Union alone did not deal with this issue.

The Red Army system represented the clearest case of keeping objectives aligned. The role of Stavka representatives, including air leaders like Novikov, as well as the subordination of air armies to land power-dominated fronts (army groups), kept all forces in the air and land domains consistently moving in the same direction. Despite the Soviet Union creating a massive air force by the end of World War II, the vast preponderance of VVS forces were devoted to CAS or a limited version of AI. The Soviets never made a major effort to produce a strategic bombing fleet or conduct widespread AI campaigns like their Americans and British counterparts.

It is worth pointing out that the Americans and British solved the problem of ensuring common understanding of objectives during World War II by essentially creating two air forces—the tactical air force that integrated with land maneuver and the strategic air force that largely operated independently with a few exceptions. By Desert Storm, the USJF developed what is essentially the current US doctrinal system; namely objectives defined by a CJTF who also apportions those air assets devoted exclusively to supporting land maneuver (identified as CAS). These observations necessarily lead to the fact that operational and tactical C2 structures are the underpinning of effective integration between the air and land domains.

A well-designed and flexible C2 structure allows domain forces the maximum freedom of maneuver within their domain while still working towards a common purpose. The structure must be designed to enable cross-domain effects; in other words, it must be capable of delivering responsive effects from one domain into another in a timely fashion. Simultaneously, the system must allow for these fires while mitigating fratricide

risk to an acceptable degree. Despite the difficulty recognizable in creating a C2 structure that possesses these traits, the current US JTF model largely meets these needs.

The current US model bears a strong resemblance to the Red Army model and includes some elements of the German and Israeli models. The CJTF sets operational objectives and prioritizes the apportionment of resources for both the air and land components. The air component, through the ATO process, allocates airpower to achieve the specified objectives as well as any implied tasks. The land component allocates resources on a more permanent basis through operations orders. This generic process enables a clear understanding of operational objectives and, on its surface, is a C2 structure that supports effective integration. Each theater and situation possess unique characteristics which necessarily cause deviations from doctrinal solutions. When considering C2 as a Joint Function, the essence of a C2 structure is to provide the ability to make informed decisions and implement those choices at a faster tempo than the enemy, reducing risk by allowing the USJF to set the pace of the combat.[3]

Each of the systems analyzed in this thesis demonstrated these characteristics. The German and Soviet systems both viewed the defeat of an enemy army as the primary means of victory and instilled this concept in their air leaders. Regardless of the positives and negatives of such an approach, leaders in both the air and land domains understood the objectives. This approach meant that leaders in those two systems developed structures that enabled very high tactical tempos through the delegation of decision-making authorities to lower levels. Both systems also extended this freedom to operational levels as well, although arguably the German system was more permissive than the Soviet Union system at higher levels. The Israeli system also gave great freedom

to domain leaders, but the 1973 war demonstrated the weaknesses of freedom decoupled from a mutually understood course of action.

The IDF possessed a well-understood operational approach to Arab attacks. However, the approach made two presumptions that failed in 1973: the IDF ground forces would be able to hold long enough to allow the IAF to gain air superiority and that the IAF would be able to gain air superiority relatively quickly then rapidly switch efforts to close support and AI. When Arab SAMs and huge tank forces eradicated these beliefs, the IAF and IDF objectives began to diverge (for understandable reasons). Luckily for the Israelis, Dayan and Elazar (Defense Minister and IDF Chief of Staff respectively) were able to establish joint objectives and put the IDF on a united path. Regardless of whether their decision was the most correct one, they were successful in getting the IDF as a whole back on the same page to deal with the continuing threat. The Israeli C2 structure, especially like the Red Army system and to a lesser degree the German system, was reasonably well-designed for adjustments to be made and quickly disseminated to the various domain forces.

<u>The Root of Multi-Domain Integration – Operational
and Tactical C2 Structures</u>

Trust and objectives are vital to ensuring that organizations run smoothly but the C2 structures are the frameworks that allow information to flow, decisions to be made and executed, and risk to be mitigated. In other words, C2 structures allow a large organization such as a JTF to execute an OODA loop. An effective structure generates a rapid and effective tempo. A poor structure creates the opposite. Trust between domains simplifies C2 structures as domain forces are permitted to conduct the war within their domain without inhibitive oversight. Trust within domains allows the delegation of

authority as appropriate, enabling faster decision-making. Joint, understood objectives keep the domains working toward a common purpose and prevent divergent courses of action. The current USJF C2 model demonstrates the lessons possible from the German, Soviet, and Israeli models but tweaks in application and mindset can improve the model for future conflicts. There are two observed lessons the USJF should consider: First, a more flexible management of authorities within the air domain may improve tempo and, second, treating domain forces as maneuver forces regardless of the domain they operate within will create perspectives more conducive to multi-domain integration. A short discussion of the US JTF structure is necessary to ensure a common understanding before elaborating on improvements.

The current US JTF C2 structures are codified in JP 3-33, *Joint Task Force Headquarters* and further developed in JPs 3-30 (Air C2), 3-31 (Land C2), and 3-32 (Maritime C2) as well as other even more specific volumes. The CJTF provides the overall course of action as well as objectives to subordinate leaders, often through the JTF staff. Subordinates can be organized either into service components, functional components, or a combination thereof. Functional components are usually used in the air domain, while service components often nest within a joint force land component. Due to their integral nature, air and land components possess the most robust doctrine regarding the structure by which the two C2 systems should be tied.

Given the centralized nature of USAF C2, the weight of land component integration occurs via the BCD, usually co-located with the JAOC. Ground Liaison Detachments (GLDs), extensions of the BCD, perform liaison functions at USAF wing headquarters. The USAF, in turn, provides an Air Support Operations Group (ASOG) to

USA corps. Each ASOG controls several Air Support Operations Squadrons (ASOSs) which are aligned with Army divisions. ASOSs possess the Air Support Operations Center, which is both a USAF Theater Air Control System tactical C2 node and a vital part of the division's Joint Air-Ground Integration Center (JAGIC). Most air integration with land forces occurs at the brigade level through the unit's Tactical Air Control Party (TACP), consisting of ALOs, JTACs, and other supporting liaisons. See Figure 25 below for an illustration of this structure.

Figure 25. Theater Air Control System / Army Air-Ground System

Source: Joint Staff, Joint Publication 3-09.3 *Close Air Support* (Washington, DC: Joint Staff, 2014), II-5.

The USJF should closely examine the means by which it manages authorities within a JTF and within components. The three examined cases all demonstrate a flexibility with authorities that ultimately benefited the respective operations. All three showed a capacity to control air operations at a high level in a centralized manner. However, all three also delegated authority to allocate or even apportion missions to lower levels as the situation warranted. The Germans tended to push authorities down to air corps, group, or even squadron commanders apart from major air operations. The Red Army typically began an operation with most authorities held at the Stavka or air army level but then pushed authorities lower in their chain, including down to the regiment level, as an operation progressed. Israel began the 1973 with a highly centralized system akin the current USAF system. However, as the situation developed in the first few days of the war the IAF was forced to delegate certain authorities to lower level leaders, notably directly allocating units to TACON of the Northern Command IAF liaison. The US system is currently incapable of this form of flexibility.

To some degree, this inflexibility is due to the complexities of managing airspace, ensuring that tactical enabling effects like air refueling, escort, and SEAD are available, and so forth. Unfortunately, though, this weakness is highly exploitable by adversaries. The current system is highly reliant on directive orders like the Air Tasking Order (ATO) to inform air units of their missions for the next day. If the ATO were denied either through lethal or non-lethal means, an air unit would have no idea of what to do. In many ways, the air component could be neutralized simply by denying the ATO. While this possibility is remote, it is a significant risk to a JTF in a contested environment. Further,

there may be situations in which pushing authorities lower might conceivably save resources.

As an example, if the air component allocated a wing to support a major land division operation the following day, allow the planners at that wing to directly liaise with the division, determine an aerial scheme of maneuver including appropriate mission times, then coordinate those parameters with the JAOC. The current system chafes at such infringement by the wing upon the purview of the USAF liaison community as well as removing some of the ability for the JAOC to define the specific parameters of all air operations. Air Force Basic Doctrine states that "[C2] is a continuum between direct control and total autonomy. Wise commanders should carefully analyze the situation and select the most appropriate method of control of their assigned and attached forces."[4] The USJF generally, but the USAF specifically, must consider providing general guidance on the conditions and techniques for JFACCs to delegate authorities to wing commanders or the like in situations in which centralized control is not easily possible or when the operations tempo demands faster, more diversified decision-making. One way to adapt the joint and air C2 structures to accommodate more flexible authorities is to consider airpower as a maneuver element.

<div align="center">Airpower as a Maneuver Force</div>

Air Force doctrine is rife with explanations of airpower as a maneuver force ("Command," "Operations and Planning,"). JP 3-0, the foundational USJF operational doctrine, defines the maneuver joint function as "the employment of forces…through movement in combination with fires to achieve a position of advantage with respect to the enemy" and includes airpower as a force capable of maneuver.[5] However, most air

functions such as SA and AI are explicitly described as elements of the fires joint function. This discrepancy highlights two points. First, alluded to within USAF doctrine, airpower does not neatly fit into one or the other function. Aircraft, and platforms in other domains such as destroyers, possess both maneuver and fires characteristics. In some respects, the differentiation between maneuver and fires may need to be broken down as domains such as cyberspace and space become more integrated into lower levels of warfare. Considering this, when developing the structures by which airpower's effects are integrated into a joint operational approach, leaders and planners must consider airpower as either a maneuver or fires mechanism since the extant structure has difficulty accommodating something that is both. This leads to the second, and larger issue.

The USJF has, in practice if not in word, placed airpower into the fires function. This perception colors virtually all aspects of the USJF C2 structure. The disconnect seems to occur with the start of the ATO cycle. The Joint Air Operations Plan (JAOP) is in many ways like an operations order any other service produces, essentially outlining the operational approach the air component will utilize to achieve joint objectives. However, the ATO planning cycle largely manages airpower as a fires asset. To illustrate this, consider that daily air apportionment recommendations are typically sent by the JFACC to the CJTF for approval via the Joint Targeting Coordination Board (JTCB), one of the central JTF mechanisms for coordinating joint fires.[6] In sharp contrast, both JP 3-31 (Land C2) and JP 3-32 (Maritime C2) discuss the requirement for the respective component commanders to synchronize and integrate maneuver with no such mandate on the JFACC within JP 3-30.[7] These are just a couple indications of the general mindset

within the US military that what airpower brings to the joint fight is predominantly fires as opposed to maneuver. None of the cases analyzed in this study display this trait.

The Germans, Soviets, and Israelis each treated airpower as a maneuver element within their operational art. The German air orders for Case Yellow (see excerpts in Appendix A) are examples of mission-type orders. One critique of the German approach to its control of airpower is that the Luftwaffe might have benefited from slightly increased centralization to improve their capacity to mass airpower at critical points. A good example of massing airpower was the impressive air attack around Sedan during Guderian's Meuse crossing. The personal interactions and relationships between the commanders of XIX Panzer Corps (Guderian), II Air Corps (Lörzer), and VIII Air Corps (von Richtofen) prepared this attack as opposed to a guiding central authority. The subsequent screening of Panzergroup Kleist's advance across France by VIII Air Corps, however, illustrates the power of delegation as individual German groups and squadrons endeavored to keep pace with the advancing armor. The Red Army likewise viewed its airpower as a maneuver element.

Even though Red Army land power subordinated airpower to its needs, the front controlled the VVS as an additional element rather than a purely supporting force. The air offensives were perfect examples of the Soviet view of airpower. The VVS massed forces along critical axes, striking into the enemy's close and deep areas to set conditions for a land attack. Once the attack commenced, aircraft repeatedly struck critical targets based upon air leaders' plans (albeit with updates from ground leaders as appropriate). Although the VVS focused its efforts on targets intended to ease the advance of land

forces, the typical approach was to provide mission-type orders similar to the German model.

The Israelis represented the most extreme example of airpower as a maneuver force. The basic IDF operational theory rested on the notion that airpower, operating as a maneuver element, would achieve a position of advantage over an Arab land force and then set conditions for a decisive defeat of the enemy. A critic might point out that this approach failed during the first days of the 1973 war. Granted, the Israelis were unable to fight the war they intended. However, once the IAF received word to focus on a primary objective—stall the Syrian assault in the Golan—the IAF was sufficiently effective at maneuvering against the Syrian formations. The costs were assuredly high, but this was predicated more on the task organization of IAF missions as well as IDF capabilities rather than flaws with the notion that airpower was a maneuver element. With these examples in mind, it is curious that the USJF perceives the best way to control airpower is as a fires element.

The best counter-argument to treating airpower as a maneuver element is that airpower is focused on delivering effects, even though it delivers those effects through maneuver. This argument posits that because the primary contribution of airpower is an effect against targets, airpower is therefore an element of the fires joint function. This argument is flawed though. All forces deliver effects against targets. Infantry occupying a position are delivering an effect against an enemy land force by denying use of that terrain to an adversary. While the USJF should not abrogate the joint targeting process or the practice of utilizing airpower as a fires asset in the appropriate context, the USJF system must treat airpower as a force capable of acting both as a fires asset *and* as a

maneuver force. The system must not only work to generate targets for the air component as an element of joint fires but also strive to look for opportunities to increase freedom of action through maneuvering to achieve effects rather than providing fires to achieve targeted effects.

Consider the CAS mission, an especially relevant example given that this mission represents the highest level of tactical integration between airpower and land power. Considering airpower as a fires asset colors virtually all aspects of the perception of CAS within both the USAF and USA. While this perception is often valid, as in the cases of Operations Iraqi Freedom and Enduring Freedom, the current paradigm lacks an appropriate recognition of context. In these environments, two primary factors merge to form a strong basis for treating airpower as a fires element. First, during those operations the US enjoyed air supremacy and the insurgent nature of the adversaries prevented airpower from conducting large-scale operational maneuver against the enemy (although the remotely piloted aircraft strikes could be considered such a maneuver). Second, the emphasis on influencing and controlling the local populations meant that airpower needed to focus its efforts on providing direct, close support for land forces. Based on these conditions, the USJF developed a perception that airpower's role is primarily to compile a list of joint targets or CAS mission requests and then "service" them as best as able. Believing these conditions to apply to all conflicts, especially conflicts against peer adversaries, is a dangerous idea.

Treating airpower as a fires asset essentially means that the authority to deliver lethal or non-lethal ordnance on a target is removed from the air component and placed into the hands of another component, primarily the land component. The depth to which

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this perception permeates the USJF today and creates this tempo-destroying environment was observed during Operation Inherent Resolve. The placement of coordination measures such as Restricted Operations Zones (ROZs) and the Fire Support Coordination Line (FSCL) resulted in a convoluted battlespace in which air maneuver was often curtailed. There were countless examples during that operation in which airpower was controlled as a CAS mission (strikes were controlled by a JTAC and approved by a high-ranking Army officer) but the nearest friendly forces were sometimes more than 40 kilometers distant from the target![8] Such an approach will result in airpower failing to deliver notable results in a more contested environment.

Going back to the conditions discussed earlier and comparing them to likely differences in a contested conflict demonstrate the failure points. It is unlikely that anyone could argue that the USJF will need to fight for air superiority, potentially even just localized and temporally limited air superiority, to conduct other missions. This will require a high degree of tactical integration between air assets as well as improved coordination between forces from other domains, somewhat breaking down the notion of supporting and supported common within the USJF. See the last principle regarding improving tactical enabler integration for more discussion on this subject. This difficulty in achieving air superiority also means that the USJF reliance on surveillance and reconnaissance to generate intelligence (and targeting data) will be severely curtailed. The US force will likely be capable of only a fraction of the tactical-level information it is used to receiving. Further, while an adversary is likely to use more conventional land weapons such as tanks and artillery pieces, experiences in Ukraine suggest even these weapons may be used in non-traditional means. Exacerbating these issues, the USJF will

probably suffer from continuous break downs in communications both due to enemy efforts as well as the natural friction of war. All of these conditions demand that tactical authority be pushed lower within the military hierarchy or risk stagnation of the system during the chaos of large-scale combat.

A mission-oriented approach to employing airpower resolves many of these dilemmas. Especially in cases of CAS or dynamic AI, planners in both the air and land domains should not concern themselves with only providing discrete targets or determining the appropriate means to control the missions from a separate C2 node. Rather, they should spend their planning time creating sound guidance for the mission commander. Consider the differences between the two orders shown below in Table X. The column on the left shows a short list of the type of information typically found in an ATO and the amplifying information found with the original air support request submitted by a TACP. The column on the right shows the same mission but with airpower treated as a maneuver element instead of as a fires element. Note the directive nature of the fires asset orders (the current system) and the dearth of amplifying information.

This system leaves very little room for initiative on the part of the air component and further means that a lack of communication once the aircraft are airborne virtually ensures their inability to accomplish anything. While the example on the right is slightly more time-consuming to produce, and to a degree the communications issues still exist, the additional information as well as the force packaging show that Razor 51 flight would possess a greater ability to achieve results in a chaotic and ambiguous environment. In the left example, Razor 51 is only capable of executing what is directed and in the

absence of information is incapable of action. In the right example, Razor 51 understands the mission's purpose and, with appropriate risk mitigation, is able to affect the battle with significantly less input from land control elements.

Table 9. Fires Asset Orders vs. Maneuver Element Orders	
Fires Asset Example (Current System)	**Maneuver Element Example (Recommended Model)**
ATO: 2 AV-8s, callsign Razor 51, with best ordnance. Report to CAS Contact Point Jacks at 1100Z, 18,000 feet MSL. Contact JTAC callsign Gator 20. Mission length is one hour. **JTAR:** 20-30 personnel in the open with three BTRs in a line and two buildings at 11S UG 80 05, 10 feet MSL. Depart Initial Point Chevy on a heading of 120° magnetic, offsetting left. Fly 15.5 NM to the target. Friendly forces are 500 meters north of the target.	**ATO:** 2 AV-8s, callsign Razor 51, part of package ABC. Mission commander is callsign Darkstar (E-8). Contact XXX Wing Ops Center for planning if able. Report to North Marshall Area at 1100Z, 18,000 feet MSL, contact Darkstar. Expect to support Gator 20 with XXX Division) Mission length is one hour. **JTAR:** First target priority is possible mech infantry platoon (20-30 personnel, three BTRs in two buildings at 11S UG 80 05, 10 feet MSL). On check-in, expect to depart from Initial Point Chevy on a heading of 120° magnetic, offsetting left due to artillery fire. Fly 15.5 NM to the target. Friendly forces are 500 meters north of the target. Brigade attacking to secure Objective X near 11S UG 12 34. Intent for air is to (1) destroy enemy artillery and (2) screen northwest flank between towns A (11S UG 23 41) and B (11S UG 34 12) to disrupt/provide warning for enemy forces larger than company-size through that area. Darkstar (XXX Wing) is Air Mission Commander for joint air support package.

Source: Created by author.

Considering airpower as a maneuver force, thereby giving it missions and targets as opposed to merely targets, greatly improves the capacity for airpower to enable land

maneuver. This relationship is not unidirectional though. Land forces can enable and support air maneuver as well.

Airpower and Land Power are Mutually Enabling and Mutually Supportive

A common perception within the USJF is that airpower primarily enables land power. Especially considering Desert Storm and the last two decades of operations throughout the Middle East, most military members would likely agree with the idea that airpower is a significant force multiplier. Perceiving the deeper relationship between airpower and land power, as with most inter-domain relationships, is important. The epigraph of this chapter from Heinz Guderian's 1936 book *Attention Panzer!* states this idea clearly. Recognition that airpower and land power are mutually enabling and mutually supporting is a key concept for accepting airpower as a maneuver force and also for developing C2 structures. Domain forces which do not necessarily view one or the other as the "supported" or "supporting" force, but rather continuously provide enabling and supporting effects for the other force will generate success for the JTF as a whole. The three cases studied each demonstrate various examples of this to one degree or another.

In the German case, airpower enabled rapid movement and maneuver of armored formations by providing security and firepower so the German tanks did not need to wait for infantry or artillery. Airpower played a crucial role in enabling the successful crossings at Sedan. In turn, German land forces overran airfields, thus allowing German aircraft to continuously move forward, extending their range into enemy territory. Additionally, German artillery provided SEAD for the Luftwaffe throughout the war. The

VVS and the Red Army had a similar relationship, although the Israeli case is an excellent example of the weight of effort shifting rapidly from one domain to another.

The 1973 war demonstrated both what might be termed the "traditional" flow of enabling effects and support—airpower enabling and supporting land power—as well as the opposite. In the first days, airpower was used to stymie the Arab advances, especially successfully in the Golan. After the war deadlocked in the Sinai, land maneuver across the Suez Canal opened a hole in the Egyptian IADS which allowed the IAF to begin rolling up the remainder of the Arab SAMs in addition to conducting its sought-after AI campaign against the Egyptian army. In both cases, while one might argue that one or the other service was being supported, in actuality both the IDF ground forces and the IAF were maneuvering towards mutual objectives, providing enabling effects and support to each other throughout their maneuvers. On the one hand this highlights the importance of understood joint objectives and treating forces as maneuver elements. On the other hand, though, this example—nearly fifty years old now—illustrates the shortfalls in the current US system.

The American system must address two concerns to realize the mutual benefits of airpower and land power. First, the system must allow for air maneuver throughout the operational area. Second, leaders in both the air and land domain must perceive the relationship as a two-way relationship, not the one-way model of air supporting land. This section addresses the former point since the previous section addressed the latter issue.

The largest issue extant in the current US system is the mindset within many leaders that airpower (and most other domain forces) exist to support land power either

directly or indirectly. While the success of land power is vital to joint success, and often is paramount, there are times when the maneuver of other domain forces is more critical to the JTF. Put another way, sometimes land power must enable maneuver in other domains, rather than always expecting to be the supported force.

US land power thought is founded on the concept that "close combat is indispensable and unique to land operations…Close combat underlies most Army efforts in peace and war."[9] While this is not in dispute, the mindset that the Army's primary function during large-scale combat is to engage in close combat with an enemy fails to recognize that sometimes land maneuver may set conditions for decisive, or at least important, efforts in other domains. Further, sometimes a strategic or operational objective may be accomplished via the means of non-land domains. Setting aside the Israeli example described previously, several American operations in the 1990s demonstrate this concept as well.

During Desert Storm, airpower was the primary tool used by Central Command to defeat the Iraqi Army. Coalition ground forces were in positions threatening to Iraqi forces occupying Kuwait. This compelled the Iraqi leaders to disposition their forces to repel a land attack, making them more susceptible to air attack. In the second Iraq invasion in 2003, airpower and land power consistently shifted the weight of effort towards defeating the Iraqi Army back and forth between them. Airpower decimated concentrated forces like the Medina Division while land power, with air support, defeated smaller formations.[10] Operation Allied Force, conducted in 1999 to remove Serbian forces from Kosovo, was an example of the weaknesses of airpower operating alone.

During Allied Force, Serbian units had no major land force to contend with. The Kosovo Liberation Army did not pose a significant threat to Serbian forces. As a result, the Serbs were able to disperse and camouflage themselves as a defense against an air attack.[11] If a credible land force was present in the area, although not necessarily requiring close combat, then the Serbs may have been compelled to deploy themselves to fight a land opponent (similarly to the Iraqis in 1991). NATO airpower would have been far more effective against such an enemy. Deploying a land force would have increased the risk to NATO troops, but the improved effectiveness of airpower would potentially have mitigated those risks. The MDO concept does not cite historical examples of cross-domain mutual support, but certainly advocates its requirement in future operations.

The USA's most recent MDO concept, published in December 2018, highlights the need for the Joint Force to conduct cross-domain maneuver and cross-domain fires. Forces must be capable of converging all available USJF capabilities in time and space to create exploitable windows of superiority.[12] Furthermore, these windows may shift between domains rapidly, requiring the USJF to rapidly shift the emphasis of which domain is enabling which on a much faster scale than current C2 paradigms allow. In the historical examples discussed, such shifts took hours or days. Windows in future conflicts may open and close in a matter of minutes (i.e., the temporary neutralization of an anti-access system). Joint, Army, and Air Force concepts recognize this fact, describing the importance of cross-domain synergy and convergence.

Cross-domain synergy, discussed in the *Joint Operational Access Concept* as well as the *Capstone Concept for Joint Operations*, is the notion that pushing integration to lower levels will enable to exploitation of even small windows of opportunity in one

domain which will in turn create opportunities in another domain and so forth. The effect of the rapid exploitation of these opportunities makes the individual domain effects of the USJF complementary rather than merely additive.[13] The USA's MDO concept paper specifically describes convergence and the USAF's *Air Force Future Operating Concept 2035* implicitly discusses the subject. Convergence is the idea that focusing cross-domain synergy on a decisive space will achieve significant, potentially decisive, effects on an adversary.[14] These ideas reflect the broader concept that success in conflict will only be achieved through concomitant maneuver in all domains. Given these historical examples coupled with the MDO ideas, the USJF should reconsider its use of the "supported" and "supporting" mindset in joint operational planning.

The USJF should abandon the notion that one service or one domain's forces are supported throughout a phase by the other domains. Such a mindset is antithetical to the concepts of cross-domain synergy and convergence. The notion that the forces of all domains should expend the bulk of their efforts to support the operations of a single domain does not allow for the ability to rapidly exploit windows of opportunities in all domains. Instead, the USJF should adopt a weight of effort mindset.

Establishing a primary weight of effort rather than a supported component creates an environment in which initiative is encouraged and the CJTF has more capacity to adjust the plan during execution. A weight of effort, aligned towards objectives as opposed to services, informs the different components where to prioritize the placement of their resources. Such an approach may seem mere semantical, but the important aspect is that none of the operations of any one component are subordinated to another. The danger in this concept is going too far and giving each component complete autonomy.

The intent is not to divide the components, thus causing the JTF to fight a separate war in each domain. The issue is that the current model of "supported" and "supporting" components means that during a given campaign phase, all domains are working to achieve success in a single domain. This is antithetical to the idea of MDO and cross-domain synergy. The goal is to "overwhelm an adversary with…problems at multiple points in time and space…[disrupting] the adversary's ability to observe, orient, decide, and act."[15] This means that a CJTF may need to shift the JTF's focus from one domain to another at a rapid pace, potentially multiple times a day, to continuously exploit opportunities and present dilemmas to the enemy. Components must still provide apportioned and allocated support to other components—only the CJTF may shift resources during execution (a situation identical to the current model). The CJTF is the one who must make this choice and the decision may only be implemented through effective C2.

This idea allows each domain to maintain its freedom of action as the operation progresses. This freedom of action enables each component to exploit any opportunities it finds while still working towards the common objective defined by the CJTF. This is not to suggest that domain forces should not integrate or synchronize. Rather, this recommendation is intended to accomplish those vital traits while still enabling the maneuver of the forces in each domain. The requirement for tactical enablers in a modern contested environment demands both freedom of maneuver and cross-domain integration.

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Contested Environments Require Well Integrated
Cross-Domain Tactical Enablers

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The statement that contested environments require well-integrated tactical enablers seems obvious in many ways. While few people would argue this point, some

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might disagree with the contention that cross-domain enablers are likely vital to the success of domain forces, especially air forces. Tactical enablers, such as escort or SEAD assets in the air domain, are reasonably effective at ensuring freedom of maneuver within a single domain. Those enablers, though, can be stymied by enemy capabilities that the enablers may not be equipped to handle. Cross-domain enablers present forces with multiple tools with which to mitigate an enemy's capabilities.

During World War II, the two primary mechanisms to shoot down aircraft were fighters or ADA. Most air forces during World War II but certainly the Luftwaffe and VVS learned to escort strike aircraft with a number of fighters. These escorts protected the strike assets from enemy fighters with varying degrees of success. Often, strike assets themselves possessed at least some capability to defend themselves from enemy aircraft. ADA represented a prolific threat but one that was seemingly viewed with less concern by aircrew as opposed to enemy fighters. While the specific tactics are not germane to this discussion, both the Luftwaffe and VVS developed tactics to mitigate ADA. Usually this was accomplished by dividing the strike package into two groups with one group targeting ADA and the other attacking the primary targets. Both German and Soviet documents also allude to integrating artillery into strike plans as a SEAD asset. While the World War II experiences illustrate the vitality of tactical enablers, the Israeli experience demonstrates the importance of cross-domain tactical enablers.

During the years between the War of Attrition and the 1973 war, the IAF largely focused on solving the Arab SAM issue through single-domain efforts. Israeli air leaders spent their resources developing electronic or tactical solutions to the SA-2s and SA-3s. As near as this author can discern, however, little effort was made to develop joint SEAD

capabilities with the IDF ground forces. Perhaps this was partly due to the IDF's dearth of long-range artillery. Nevertheless, the IAF was aware of most of the Egyptian SAM site locations and many of the Syrian sites as well (obviously excluding the SA-6 batteries). None of the sources describing the IAF's major anti-SAM plans Dougman V or Model include any attempt to integrate ground force effects. Artillery SEAD would have greatly improved the successes of SAM strikes on the Sinai, potentially opening the Egyptian bridgeheads to air attack. A capability to integrate artillery SEAD dynamically, during mission execution, would have dramatically improved effectiveness and survivability in the Golan. As it stood, the IAF achieved air superiority in the Golan primarily by making the Syrians run out of missiles, hardly a recipe for success in modern conflict.

The USJF should learn from this experience to note that, while tactical enablers operating within one domain are important, it is equally vital to develop cross-domain tactical enablers. Applying this notion to the current USAF conception of a large air mission package emphasizes the concept itself as well as the doctrinal, organizational, and training methods that can achieve this goal without resorting to purely material solutions. Consider a typical air mission: the core portion of the package is likely some conglomeration of strike assets (those assets whose primary purpose is to deliver lethal ordnance on a set of targets). This core group is supported by a constellation of C2 and intelligence, surveillance, and reconnaissance assets to provide information and direction. Further tactical enablers in a contested environment include an escort package (intended to protect the mission assets from enemy fighters) and a SEAD package (intended to suppress or destroy enemy ADA). Note that the entire mission is composed of assets

operating in the air domain although elements of the cyber and space domains might also be present. This model (all parts of a mission unit composed of assets in a single domain) was the same model used by the Luftwaffe, VVS, and IAF.

This model worked reasonably well for the Luftwaffe and VVS but notably broke down for the IAF. This author presumes that it broke down for two reasons present in 1973 which are both applicable to the current USJF. First, IAF leadership assumed that there would be adequate time to conduct a focused air superiority campaign prior to devoting major resources to AI. Second, the IAF had no good answer within the air domain for the dense Arab SAM umbrella, especially the SA-6, and, at least in the sources found by the author, there was no significant discussion within the IDF to find a joint solution to the SAM problem. The first problem is an often-asserted assumption within the USA and USAF today.

A common refrain in the USAF when discussing contested environments is that "we won't be doing anything except OCA until we've established air superiority." Army officers often state "the Air Force won't be around during large scale combat" are common as well. This mindset fits neatly into Air Force doctrine and experience (and the IAF's as well) but is often misapplied by USAF officers. However, consider the Russian incursion into Georgia in 2008 (five days), the Russian seizure of Crimea (six days from armed forces intervention until *de facto* control), and a recent RAND wargame of a Russian invasion of the Baltics (Russian dominance within 60 hours). Presuming a similar scenario, the USJF may be required to conduct operations intended to prevent an adversary's ability to complete a *fait accompli*.

The narrow windows of opportunity, therefore, may not allow for lengthy campaigns. An entire operation may need to be conducted within the space of a week or less. The USJF will not have the luxury of waging an air superiority campaign prior to conducting significant operations against targets in other domains (notably the land domain). This means that, while air superiority is required to conduct counterland missions, the requisite air superiority will be limited both in geographic and temporal terms. The USAF must be ready to fight to push a "bubble" of air superiority over engagement areas and hold that bubble while the strike assets conduct their attacks. This requirement necessitates discussion concerning the means by which the USAF attains air superiority.

The USAF generally appears to perceive that the best tools to use as tactical enablers for aircraft are other aircraft. Planes like the F-22 and F-35 are explicitly designed to enable air maneuver. While the USAF makes attempts to integrate cyber and space domain effects into its air maneuver, the USJF and USAF should consider testing and indoctrinating joint TTPs for more flexible integration of tactical enablers. For example, rocket artillery provides excellent SEAD capability but the responsiveness of such a battery to immediate air component requests is likely insufficient to target highly mobile modern ADA. Placing a rocket artillery battery in direct support of an air mission with appropriate C2 connections could dramatically improve effectiveness. If a large air mission package was expecting to operate in a division's deep area, under what criteria might the division commander allow a rocket artillery battery to operate in direct support of that package? What should the tactical C2 structure look like? Questions like these

must be answered by the Joint Force through robust experimentation and training to enable MDO in the near future.

In keeping with the previously discussed notion that airpower and land power are mutually enabling, the USJF should address the fact that TTPs to integrate tactical enablers largely flow from the air domain to the land domain. The mechanisms and TTPs elucidated in JP 3-09.3 *Close Air Support* are one major indication of this directional flow. Despite a brief discussion of utilizing cannons for SEAD in the Multi-Service TTP *Joint Fires* (commonly known as JFIRE) manual, no notable TTP exists for integrating land domain tactical effects to enable air maneuver. The fight for air superiority against a peer adversary will likely demand that forces in both domains are able to enable the maneuver of forces in the other domain.

Final Conclusions

In summary, this thesis sought to assess the historical means by which air and land maneuver were integrated in contested environments. In many ways, the current USJF system demonstrates many of the applicable lessons from the German, Soviet, and Israeli systems analyzed. This is likely due to the fact that the Americans learned their own similar lessons during World War II and also significantly studied the 1973 Arab-Israeli War. Nevertheless, there are some issues with the current American system, predominantly centered on the mindset of US leaders. To be successful in a modern contested environment, a system must enable freedom of action and ensure that the initiative that stems from such freedom is focused on achieving discrete, jointly-defined objectives. C2 structures are the foundation for creating such an environment. Trust is essential to ensuring streamlined C2 structures. Considering that airpower and land power

are mutually enabling and mutually supporting, as opposed to one supporting the other, requires trust but ensures that the necessary initiative is possible within all domains. Finally, by viewing the operations area as a joint battlespace, leaders can begin to recognize that support and enabling effects flow between all domains, not exclusively from certain domains towards other domains. Altering the paradigm within US officers' minds to adopt these views is a challenging task, but one that should be a primary focus for the USJF, USAF, and USA in the coming years.

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[2] Roy J. Lewicki, Daniel J. McAllister, and Robert J. Bies, "Trust and Distrust: New Relationships and Realities," *Academy of Management Review* 23, no. 3 (Fall 1998): 439.

[3] JP 3-0, III-2-III-3.

[4] LeMay Center for Doctrine, Air Force Doctrine, *Volume 1, Basic Doctrine*, February 27, 2015, https://www.doctrine.af.mil/Portals/61/documents/Volume_1/V1-D81-CC-DE.pdf.

[5] JP 3-0, III-34.

[6] JP 3-30, III-22.

[7] Joint Staff, Joint Publication (JP) 3-31, *Command and Control for Joint Land Operations* (February 2014), II-2, accessed 14 May 2019, https://www.jcs.mil/Portals/36/Documents/Doctrine/ pubs/jp3_31.pdf?ver=2019-03-15-102130-013; Joint Staff, Joint Publication (JP) 3-32, *Command and Control of Joint Maritime Operations* (June 2018), II-6, accessed 14 May 2019, https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp3_32.pdf?ver=2019-03-14-144800-240.

[8] Maj Kyle Rykaczewski, interview by author, Kansas City, 23 February 2019.

[9] Headquarters, Department of the Army (HQDA), Army Doctrine Publication (ADP 3-0), *Operations* (Washington, DC: Government Printing Office, November 2016), 4.

[10] Bruce R. Pirnie, Alan Vick, Adam Grissom, Karl P. Mueller, David T. Orletsky, *Beyond Close Air Support: Forging a New Air-Ground Partnership* (Santa Monica, CA: RAND Corporation, 2005), 17.

[11] Ibid., 45.

[12] Army Training and Doctrine Command (TRADOC), TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations* (December 2018), C-1, accessed 14 May 2019, https://www.tradoc .army.mil /Portals/14/Documents/MDO/TP525-3-1_30Nov2018.pdf.

[13] Joint Chiefs of Staff, *Capstone Concept for Joint Operations: Joint Force 2020*, (September 2012), 7, accessed 14 May 2019, https://www.jcs.mil/Portals/36/Documents/Doctrine /concepts/ccjo_jointforce2020.pdf?ver=2017-12-28-162037-167..

[14] TRADOC, 20.

[15] Joint Staff Joint Force Development (J7), *Cross-Domain Synergy in Joint Operations: Planner's Guide* (January 2016), 5, accessed 14 May 2019, https://www.jcs.mil/Portals/36/Documents/Doctrine/concepts/cross_domain_planning_guide.pdf?ver=2017-12-28-161956-230.

APPENDIX A

EXCERPTS OF LUFTWAFFE ORDERS

From Hitler's Directive #6 for the Conduct of the War in the Western Theater, 9 October 1939:

The Air Force will prevent action by the Franco-British air forces against our army forces, and will support the advance of our army forces to the extent necessary. Here, it will be particularly important to…prevent the landing of British troops in Belgium and Holland.

From Air Force Commander-in-Chief Directive #5, Plan for the French Campaign, 7 December 1939:

The mission of the Air Force is, while continuing operations against British naval forces and their bases, to employ the bulk of its forces in tightly concentrated action supporting the Army in main pressure areas. Here, it will initially be of primary importance

a. To support our attacking armies in breaching the border fortifications and the defenses at the various and numerous phase lines. Concurrently, all-out attacks will be launched to delay the forward movement of Anglo-French forces and rearward elements of the Belgian Army, and to prevent any landing of troops.

b. …The Second Air Fleet will give direct support to the attack by the Sixth Army (Grevenbroich), prevent the forward movement of enemy reinforcements to the areas at the front, and attack troops which might be disembarking at the coast of Belgium and Holland…The VII Air Corps, under Brigadier General Freiherr von Richtofen, on the first day attack will support with elements an airborne operation by the 7th Parachute Division, and otherwise will be instructed to give the strongest possible direct support to

the Sixth Army. The primary mission of this corps will be to decimate the Belgian Army west of the Meuse River. It is emphasized that attacks against settled areas are authorized if such settlements are unmistakably occupied by troops.

The Third Air Fleet will give direct support to the attacking forces on the flanks of Army Groups B and A, and will take effective action to delay the forward movement of enemy forces from France…

The I Air Corps, under Lieutenant General Grauert, will commit elements in continuous missions of close support for the Fourth Army (Fuskirchen), and at an early stage will attack enemy forces moving forward from the Valenciennes-Fumay line towards the Meuse River…

The II Air Corps, under Brigadier General Lörzer, will delay the forward movement of enemy forces from the French interior by means of air attacks against those rail and road routes leading to and across the French border on which military traffic is detected…

From Hitler's Directive #21 for the Plan for Strategic Concentration for Operation Barbarossa, 18 December 1940:

The mission of the Air Force is to prevent as far as possible participation of Russian air forces, and to support the combat operations of our army forces in areas of main effort, namely, in the zone of Army Group Center, and in the main effort area on the flank of Army Group South. During major operations, the Air Force will concentrate all units to support the Army. Attacks against the enemy industry will be executed only after the operational objectives of the Army have been reached. Cooperation will be as follows: Army Group South to be supported by Fourth Air Fleet, Army Group Center to be supported by Second Air Fleet, Army Group North to be supported by First Air Fleet.

The Air Force will shift the emphasis in air attack operations to the northeastern frontage by transferring the bulk of VIII Air Corps units to the First Air Fleet. The reinforcements will be moved in early enough to permit their commitment at the opening of the attack by forces of Army Group North (early on 6 August).

Source: Paul Deichmann, *The System of Target Selection Applied by the German Air Force in World War II*, vol 1, USAF Historical Studies No. 186 (Maxwell AFB, AL: Air University, 1956), 103-121.

APPENDIX B

EXCERPTS OF SOVIET ORDERS

From Stavka Directive No. 170697 to the Commanders of the Southwestern and Voronezh Fronts and the Stavka Representative on the Confirmation of the Plan for Operation Saturn, 3 December 1942 (*emphasis added*)

1. The plan for operation Saturn of 2 December of this year is confirmed.

2. The operation's readiness; that is, *the completion of the operation's preparation – the delivery of ammunition and the putting of the troops and aviation in complete combat readiness* – is timed for 9 December.

3. The occupation of the jumping off area is to take place on the night of 9-10 December. The operation is to begin on 10 December.

4. The control of both fronts' aviation is to be entrusted to Lieutenant General of Aviation Falaleev [a Stavka representative in the area].

5. The coordination of both fronts' activities in preparing the operation and conducting it is to be entrusted to Colonel General of Artillery comrade Voronov.

Source: Soviet General Staff, *Rollback: The Red Army's Winter Offensive along the Southwestern Strategic Direction, 1942-43*, ed. and trans. Richard W. Harrison (Solihull, UK: Helion & Company, Limited, 2016), 347.

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