

A CRITICAL SEAM: ORGANIZING AIR COMMAND
AND CONTROL FOR PEER CONFLICT

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Art of War Scholars

by

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ABSTRACT

A CRITICAL SEAM: ORGANIZING AIR COMMAND AND CONTROL FOR PEER CONFLICT, by Major Dustin C. Johnson, 118 pages.

The emerging era of great power competition presents a clear mandate for U.S. military forces to prepare for, deter, and, if necessary, prevail in conflict against a peer adversary. Yet the primary enabler of decisive U.S. airpower—its air command and control (C2) system—is not optimized for this kind of fight. While future concepts such as Joint All Domain Command and Control (JADC2) offer a potential path forward in the decades to come, short-term solutions are needed should a crisis arise in the interim.

This study analyzes the organization of the current Air C2 system, focusing specifically on the relationship between the Air Operations Center (AOC) and the Wing, to determine the changes needed to improve the system for peer conflict. The author begins with a review of Air C2 history and theory, covering key ideas and events that explain the system as it exists today while drawing attention to areas that are problematic in peer conflict. A thorough analysis is then conducted to characterize Air C2, identify its functions, and demonstrate how the system responds to threats. The findings of the study reveal an excessively high degree of centralization at the AOC, a problem that creates a vulnerable, single point of failure in the Air C2 system. To address this issue, the author argues that the development of a tailored C2 capability at the Wing level is essential. Ultimately, recommendations are provided as to how this might be achieved quickly—within existing resource constraints—as the study calls for airpower thinkers to reconsider contemporary notions of Air C2.

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ACRONYMS

A2AD	Anti-Access, Area Denial
ACC	Air Component Commander
ACE	Agile Combat Employment
ADCON	Administrative Control
AE	Aeromedical Evacuation
AEW	Air Expeditionary Wing
AFCENT	Air Forces Central Command
AFFOR	Air Force Forces
AFI	Air Force Instruction
AI	Air Interdiction
AMD	Air Mobility Division
AOC	Air Operations Center
AOD	Air Operations Directive
AOR	Area of Responsibility
ASAT	Anti-satellite
ASOC	Air Support Operations Center
ATO	Air Tasking Order
AWACS	Airborne Warning and Control System
C2	Command and Control
CAS	Close Air Support
CBA	Conditions-Based Authority
CC/DE	Centralized Control, Decentralized Execution
CC/DC/DE	Centralized Command, Distributed Control, Decentralized Execution

COD	Combat Operations Division
COMAFFOR	Commander, Air Force Forces
CONUS	Continental United States
COP	Common Operating Picture
CP	Command Post
CPD	Combat Plans Division
CRC	Control and Reporting Center
DAFMAN	Department of the Air Force Manual
DCA	Defensive Counterair
DOD	Department of Defense
EW	Electronic Warfare
FAC(A)	Forward Air Controller (Airborne)
FOC	Full Operational Capability
GPS	Global Positioning System
ISR	Intelligence, Surveillance, and Reconnaissance Division
ITO	Integrated Tasking Order
JADC2	Joint All Domain Command and Control
JAO	Joint Air Operations
JAOP	Joint Air Operations Plan
JFC	Joint Force Commander
JP	Joint Publication
JSTARS	Joint Surveillance Target Attack Radar System
LNO	Liaison Officer
MAAP	Master Air Attack Plan
MAJCOM	Major Command

MCO	Major Combat Operations
MOE	Measure of Effectiveness
MOP	Measure of Performance
MPC	Mission Planning Cell
MTO	Mission-Type Orders
NAF	Numbered Air Force
NSS	National Security Strategy
OCA	Offensive Counterair
OODA	Observe, Orient, Decide, Act
OPCON	Operational Control
PACAF	Pacific Air Forces
PED	Processing, Exploitation, and Dissemination
PR	Personnel Recovery
SATCOM	Satellite Communications
SD	Strategy Division
SME	Subject Matter Expert
SOP	Standard Operating Procedure
SPINS	Special Instructions
SRQ	Secondary Research Question
TAC(A)	Tactical Coordinator (Airborne)
TACC	Theater Air Control Center
TACP	Tactical Air Control Party
TACS	Theater Air Control System
USAF	United States Air Force
USAFE	United States Air Forces Europe

WOC Wing Operations Center

XP Wing Plans

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PREFACE

Just prior to the completion of this thesis, the United States Air Force began a significant overhaul of its standing doctrine at the order of its Chief of Staff, General Charles Q. Brown. On April 22, 2021, a new capstone document was released, titled Air Force Doctrine Publication 1, *The Air Force*. It is difficult to overstate the importance of the changes in the new doctrine, not the least of which is the transformation of the decades-old primary tenant of airpower, “Centralized Control, Decentralized Execution.” In its place is a new tenet—mission command. Readers will find that both of these concepts are fundamental, central themes of this study, although they were written about prior to the new doctrine being released. The willingness of the Air Force to embrace the concept of mission command through “centralized command, distributed control, and decentralized execution” is a bold step, one which adds an even greater sense of urgency to findings and recommendations herein.

CHAPTER 1

INTRODUCTION

History is not kind to nations that go to sleep. Pearl Harbor woke us up and we managed to win, although we are already forgetting the dark days when victory was uncertain, when it looked as though the scales might be tipped the other way.
—General George C. Kenney, quoted in “Quotations on Airpower”

Background

Today the United States military is operating in a global strategic environment with extraordinary levels of complexity and uncertainty. The potential for conflict between great powers is greater than it has been since the end of the Cold War; a reality that is exacerbated by the unprecedented pace of technological advancement, the scale of global connectivity, and the ever-expanding spectrum of weaponized effects. Furthermore, the growing importance of cyberspace and its implicit anonymity have blurred the traditional lines of conflict and emboldened states to take increasingly overt adversarial actions against one another. Great power military activities in places such as the Black Sea, the South China Sea, Syria, Libya, and the Arctic, have created a series of potential flashpoints across the globe. Meanwhile, long-standing alliances such as the North Atlantic Treaty Organization and emerging regional coalitions of opportunity¹ inherently contain the conditions for regional conflict to expand globally. One could surmise this is a “powder-keg” moment akin to the early 1900s prior to the outbreak of World War I. The increasing potential for conflict amongst great power states has been

¹ Alexander Korolev, “On the Verge of an Alliance: Contemporary China-Russia Military Cooperation,” *Asian Security* 15, no. 3 (2019): 233-252.

widely acknowledged and is driving change across the United States military. To deter such conflict, the joint force must be credibly prepared to win it.

In 2017, the National Security Strategy (NSS) of the United States was updated to recognize the return of great power competition.² Within the NSS is a clearly stated mandate for the joint force to prepare to fight and win in peer competition, and if necessary, conflict.³ As the primary service leading Joint Air Operations (JAO), the United States Air Force (USAF) needs to institute significant changes to meet this intent. The challenge lies in overcoming two decades of institutional inertia which has been aimed at winning counter-insurgency conflicts in largely uncontested environments. Several of the ways JAO are conducted in today's conflicts are either not applicable in major combat operations (MCO) or would be significantly contested, if not outright denied, in MCO versus a peer adversary. One of those ways is how the Air Force executes command and control (C2) of JAO to deliver decisive airpower for the joint force.

Problem Statement

While national strategy dictates the need for joint military forces to be prepared to win in peer conflict, the Air Force's current organization of Air C2 is not optimized to do so. It has been shaped by decades of war fought against less capable adversaries conducted from a largely uncontested position of advantage, not by the need to deliver

² U.S. President, *National Security Strategy of the United States of America* (Washington, DC: December 2017), <https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf>, 27.

³ Ibid., 4.

decisive joint airpower in a highly contested conflict. Furthermore, the current arrangement creates a vulnerable single point of failure that can be exploited to devastating effect. The Air Force must reorganize its Air C2 capability to meet the demands of the rapidly evolving security environment.

Purpose of Study

This study was designed to conduct an in-depth analysis of how the USAF organizes units to produce the desired combat effects in JAO, focusing specifically on the seam between the Air Operations Center (AOC) and the Wing. Further details regarding the ACC, AOC, and Wing, are provided in the “Definition of Terms” section of this chapter.

The author conducted research to develop a detailed understanding of the organizational mechanisms and associated functions of the AOC and the Wing that enable Air C2, then established clear connections to the problem statement. The author then conducted functional and system analysis to produce recommendations as to how the Air Force should organize its Air C2 system to best meet the intent of the national strategy. This process also included an assessment of existing recommendations within the air community and enables the author to provide alternative recommendations for specific gaps that were identified. The ultimate purpose of this study is to provide relevant input to ongoing discussions within the air community regarding Air C2 and to inform current efforts. Additionally, this study serves as a compilation of current and relevant sources on the topic and as a starting point for further research.

Research Questions

Primary Research Question

How should the Air Force's primary operational C2 entity, the AOC, and its primary warfighting unit, the Wing, organize within an Air C2 system to ensure delivery of air effects in a conflict with a peer adversary?

Secondary Research Questions (SRQ)

SRQ 1

How is the AOC currently organized and what are the key functions the AOC must perform that drives that organization?

SRQ 2

How is the Wing currently organized and what are the key functions the Wing must perform that drives that organization?

SRQ 3

How do the organizational structures of the AOC and the Wing interact to produce air effects in combat?

SRQ 4

What defines a peer adversary in terms of threat capabilities it possesses that can contest Air C2?

Methodology

The author conducted a Qualitative Case Study of Air C2. This study used systems theory as a theoretical framework, focusing on how the AOC and the Wing

function as an organizational system to deliver Air C2 in combat operations against a peer adversary. To facilitate the Case Study, data was collected through document analysis and a series of semi-structured interviews. The author's data sample was developed utilizing chain sampling; "a nonprobability, purposeful approach to data collection."⁴ The data sample culminated once saturation was achieved, meaning data collection concluded once the data became redundant.⁵ A more detailed description of the research methodology is provided in Chapter 3.

Definition of Terms

The majority of terms used throughout this document are well defined in Joint or Air Force doctrine. However, the foundational terms of this study will be described here to establish a solid base for understanding and to orient readers who may be unfamiliar with JAO. Additionally, a few key terms warrant further discussion due to nuanced differences between command and control, and how they will be standardized for this study.

Commander, Air Force Forces (COMAFFOR): In Joint operations, the COMAFFOR is the Air Force service component commander who possesses the responsibilities and authorities derived from his or her roles in fulfilling the Service's

⁴ Sharan B. Merriam and Elizabeth J. Tisdell, *Qualitative Research: A Guide to Design and Implementation*, 4th ed. The Jossey-Bass higher and adult education series (San Francisco, CA: John Wiley & Sons, 2015), 98.

⁵ Ibid., 101.

administrative control (ADCON) function.⁶ The COMAFFOR organizes, trains, and equips, Air Force forces which are presented to the Joint Force Commander (JFC). Additionally, the COMAFFOR utilizes an AFFOR staff, in coordination with the AOC, to exercise operational command and control of air forces.⁷

Joint Force Air Component Commander (JFACC): In Joint operations, the JFACC is a senior airman, not necessarily from the Air Force, chosen by the JFC to establish unity of command and unity of effort for JAO. The JFACC role will normally be assigned to the Air Force component commander if that commander possesses the preponderance of air forces for a given operation, and the ability to effectively plan, task, and control joint air operations.⁸ The JFACC role involves operational authorities beyond that of the COMAFFOR role. The JFC in almost all cases designates the COMAFFOR as the JFACC.⁹ If a JFACC is given authority over coalition forces, his title changes to Combined Force Air Component Commander (CFACC).

Air Component Commander (ACC): For the purposes of this study, ACC is a generic term used to describe an Air Force commander who executes both the

⁶ Department of the Air Force (DAF), Air Force Doctrine Publication (AFDP) 3-30, *Command and Control* (Maxwell Air Force Base, AL: Curtis E. Lemay Center for Doctrine Development and Education, 2020), 2–3.

⁷ Department of the Air Force (DAF), Department of the Air Force Manual (DAFMAN) 13-1, *Operational Procedures-Air Operations Center (AOC)/Operations Center (OC)*, vol. 3 (Washington, DC: DAF, 2020), 11-12.

⁸ Office of the Chairman of the Joint Chiefs of Staff (CJCS), Joint Publication (JP) 3-30, *Joint Air Operations* (Washington, DC: JCS, 2019), II-2.

⁹ DAF, AFDP 3-30, 3.

COMAFFOR and JFACC roles.¹⁰ If distinction between roles is required, the terms will be used separately as described by the definitions listed above.

Air Operations Center (AOC): The AOC is the senior agency of the ACC that provides command and control of Air Force air and space.¹¹ operations and coordinates with other components and Services.¹² In other words, the AOC is an organization comprised of people, processes, and systems, commanded by the ACC to conduct air and space operations. If the AOC includes personnel from two or more services, it is labeled a Joint Air Operations Center (JAOC). If coalition forces are involved, it is now a Combined Air Operations Center (CAOC).¹³ While modern-day operations will most likely call for either a JAOC or a CAOC, this paper uses AOC as a generic term to describe the Air C2 entity regardless of whether it is Joint or Combined.

Wing: The Wing is an echelon of Air Force command with a distinct mission and significant scope, usually composed of a primary mission group and the necessary supporting groups, and possesses organic self-support capabilities in functional areas such as maintenance, supply, and conventional munitions.¹⁴ The Air Force defines three broad categories of Wings; Operational Wings, Air Base Wings, and Specialized Mission

¹⁰ DAF, AFDP 3-30, 3.

¹¹ The definition here is still reflected in doctrine; however, the newly established United States Space Force (USSF) is beginning to take over operations in space.

¹² CJCS, JP 3-30, GL-6.

¹³ DAF, AFDP 3-30, 23.

¹⁴ Department of the Air Force (DAF), Air Force Instruction (AFI) 38-101, *Manpower and Organization* (Washington, DC: DAF, 2019), 74.

Wings.¹⁵ Wings can be further identified by their primary mission or mission aircraft, for example, the 48th Fighter Wing. In this thesis, the term Wing is used to refer to an Operational Wing; specifically, one with the requisite assets to produce air effects during JAO. Analysis of this type of Wing is required to understand the broader implications of how the Wing fits into Air C2 as a system.

Command and Control (C2): The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission.¹⁶ Within the definition of C2, JP 1 further defines command as “the art of motivating people and organizations into action to accomplish missions” and control as “manag(ing) and direct(ing) forces and functions consistent with a commander’s command authority.”¹⁷ Regarding C2, joint doctrine also states that “control is inherent in command.” Readers familiar with JAO may associate the terms “C2” or “Air C2” with tactical C2 assets, such as the E-3 Airborne Warning and Control System (AWACS). However, unless specifically stated otherwise, the author will be discussing Air C2 holistically, which includes elements at both the operational and tactical levels of war. While the terms “command” and “control” seem inextricably linked, it is necessary to draw a clear distinction between the two when used separately.

¹⁵ DAF, AFI 38-101, 74.

¹⁶ Office of the Chairman of the Joint Chiefs of Staff (CJCS), Joint Publication (JP) 1, *Doctrine for the Armed Forces of the United States* (Washington, DC: JCS, 2017), I-18.

¹⁷ Ibid.

Command: The authority that a commander in the armed forces lawfully exercises over subordinates by virtue of rank or assignment.¹⁸ When distinguishing between command and control, this paper defines command in terms of those authorities and responsibilities possessed by the ACC which cannot be delegated.

Control: Authority that may be less than full command exercised by a commander over part of the activities of subordinate or other organizations.¹⁹ When distinguishing between command and control, this paper defines control in terms of specific control activities which the JFACC may delegate to a subordinate commander.

Centralized Control: Giving one commander the responsibility and authority for planning, directing, and coordinating a military operation or group/category of operations.²⁰ This definition adequately describes one-half of the Air Force tenet, “Centralized Control and Decentralized Execution” (CC/DE). The following two terms are established to propose alternatives to current doctrine.

Centralized Command: Follows the same definition of Centralized Control as stated above; however, Centralized Command implies the ability to delegate specific control activities to subordinate commanders. This term is used to discuss a proposed construct of Centralized Command, Distributed Control, and Decentralized Execution (CC/DC/DE).

¹⁸ CJCS, JP 1, GL-5.

¹⁹ Ibid., GL-6.

²⁰ CJCS, JP 3-30, I-3.

Distributed Control: The conditional, adaptive delegation or assumption of control activities through orders or protocols to synchronize operations, maintain initiative, and achieve commander's intent.²¹ This term is also used to discuss CC/DC/DE.

Limitations

This study was primarily limited by classification. Discussion regarding detailed and technical specifics of C2, especially as they relate to critical capabilities or vulnerabilities, quickly falls into the classified realm. The author has focused the analysis around organization in order to arrive at meaningful conclusions within an unclassified study. However, some results of the study may be invalidated by unknown classified considerations. The study was also limited by the time available to complete it within one academic year. The time limitation was a significant factor in the chosen delimitations

Delimitations

To scope the study, the author utilized three primary delimitations. First, research and analysis in this thesis was focused on organizational aspects of the AOC, the Wing, and their direct corollaries. Implications regarding other relevant areas such as force presentation, protection, and sustainment were not a significant area of research. Second, recommended solutions to the problem statement only included those which could be accomplished with existing resources. Recommendations that would require material solutions or depend on the development of future technology were not considered.

²¹ Gilmary Michael Hostage III and Larry R Broadwell, "Resilient Command and Control: The Need for Distributed Control," *Joint Force Quarterly*, no. 74 (July 2014): 6.

Options that require investment in a new echelon of command²² were not included either due to the personnel implications such an approach would incur. Finally, the study did not consider solutions that are dependent on the actions of sister services or allied forces. The intent was to limit the study to those aspects which are within the span of control of the USAF. However, the author recognizes the important role of joint and allied partners in the greater context of JAO; joint and allied considerations are a critical part of this study and are evident in all aspects of the research. The recommendations proposed in thesis are made with JAO in mind and are meant to be compatible in joint and allied environments.

Significance of the Study

In recent years, there has been a growing consensus across Air Force senior leadership acknowledging that the current Air C2 construct would not be fit for purpose in a peer conflict. This problem has been the center of several high-profile studies, conferences, and exercises.²³ As a result, there is a growing body of work and solutions being developed. This research project aims to add to that body of work and to advance the conversation. Additionally, much of the research brainpower in the air community is

²² One example would be an Air Expeditionary Task Force (AETF), which Air Force doctrine describes as a “sub-theater-level” echelon of command. See DAF, AFDP 3-30.

²³ Several key studies and exercises are cited throughout this study and listed in the Bibliography. The author also draws on first-hand knowledge from participation in several conferences such as Weapons and Tactics Conferences (WEPTAC, Ramstein AB, Germany, and Nellis AFB, NV) from 2017-2019, the 2019 Air C2 Summit (Washington, DC), the 2019 Air, Space, and Cyber Conference (Washington, DC), and the 2019 Joint Air and Space Power Conference (Essen, Germany).

currently aimed at realizing the future capability of Joint All Domain Command and Control (JADC2). While JADC2 is promising in theory, the Department of Defense (DOD) currently projects it will not reach its Full Operational Capability (FOC) until 2035.²⁴ This study is intended to provide Air C2 solutions that are achievable within current USAF means; to bridge the gap between now and JADC2, a capability that is at least fourteen years on the horizon.

Summary

The return of great power competition has rekindled a sense of urgency across the United States defense community. The United States' NSS acknowledges the fact that America once again has nation-state peers capable of achieving at least military parity, and in some areas may even exceed its own capabilities. Massive changes are underway to reverse twenty-plus years of institutional inertia and recreate a force that is ready to win in large scale combat operations. Since Desert Storm, the USAF has delivered airpower more decisively than any other air force in history. However, adversaries have been watching. They have developed several capabilities that can deny the way the Air Force has done business so successfully in the past. To ensure that airpower can continue to be decisive in future combat operations, the USAF must evolve its concepts of Air C2.

²⁴ Theresa Hitchens, "'Bold Quest' To Demo Allied Connectivity for All-Domain Ops," *Breaking Defense*, August 24, 2020, <https://breakingdefense.com/2020/08/bold-quest-to-demo-allied-connectivity-for-all-domain-ops/>.

CHAPTER 2

LITERATURE REVIEW

Out-of-date theories have consistently proved the ruin of armies.
—J.F.C. Fuller, *War and Western Civilization*

Introduction

In the long history of military operations, air forces are pretty new to the scene. It has been just over one-hundred years since aircraft first made an appearance in the military, a blip on the timeline compared to land and naval forces that have existed for millennia. Despite this relatively short period of existence, there is no shortage of airpower literature. A wide range of works address theory, history, and doctrine of airpower, how it should be employed, and how it should be commanded and controlled. For the purposes of this thesis, a thorough review of relevant literature is fundamental to a comprehensive understanding of Air Command and Control (C2).

In this chapter, the author focuses on literary works regarding Air C2; specifically, the history and evolution of Air C2 which has driven current constructs and provides context to the prevalent thought amongst airmen today. The literature review is directly tied to the problem statement in Chapter 1 and, accordingly, is broken into two broad themes: 1) The organization and over-centralization of Air C2; and 2) Air C2 in contested environments. Within these themes, the author identifies literary works that have forged a relatively stable consensus regarding how airpower should be applied in combat, bringing attention to the stark contrast between contested and uncontested Air C2 environments. The author also conducts a thorough review and critique of recent

publications and scholarly works that have contributed to the on-going discussion within the air community.²⁵

The Organization and Over-Centralization of Air C2

The first theme apparent in the literature review is a relative consensus amongst Air Force senior leaders and strategic thinkers that the current Air C2 construct is overly centralized, generally meaning that too many processes and decisions are held at the highest level of command. It is well known amongst military thinkers that over-centralization of C2 can cause a myriad of problems for military commanders. Placing too much decision authority with a single commander lengthens decision processes across subordinate echelons of command, which results in slower response times for the fighting force as a whole. Over-centralization dissipates subordinate commanders' initiative and ability to execute flexibly in combat. In some cases, it can even lead to paralysis of a fighting force. If a subordinate force is dependent on direction from a higher commander before it can act, and that higher commander's decision cycle is disrupted by the enemy such that decisions are delayed or not made at all, then the subordinate force is unable to act.

While these ideas may seem fairly straight forward, the unique qualities of airpower and the history of Air C2 make this a much more nuanced dialogue. Therefore, to focus the discussion within the broader theme of over-centralization, the author has

²⁵ Many of the literary works on this topic reiterate similar ideas with minor differences. To increase the richness of the discussion, this chapter will focus on a few key pieces that represent the most significant ideas to explore in depth. Writings researched on this topic but not mentioned in this chapter are found in the bibliography.

identified two significant sub-themes: 1) the problematic evolution of Centralized Control / Decentralized Execution (CC/DE), and; 2) the search for solutions.

The Problematic Evolution of CC/DE

The first of these two sub-themes is best captured by then Lt Col Clint Hinote in his monograph titled, *Centralized Control and Decentralized Execution: A Catchphrase in Crisis?* published by the Air Force Research Institute in 2009. The essence of Hinote's argument is that CC/DE, what he calls the Air Force's "master tenet," has devolved into a dogma that is simultaneously preached by airmen yet not well understood, instead of the malleable doctrinal tenet it is intended to be. Furthermore, this dogmatic application of the master tenet has significantly contributed to the Air Force's highly centralized C2 organization in all military operations, even when high levels of centralization are not necessary or are even problematic.

Hinote builds a strong case, correctly pointing out that the challenge of achieving balance between centralization and decentralization is not a new problem and is not unique to the Air Force. He draws on B.H. Liddel Hart to point out the dualistic nature of centralization, stating "there is a trade-off between centralization and decentralization in any military operation . . . As with any trade-off, we must appreciate the factors involved to achieve the proper balance."²⁶ To demonstrate this point, Hinote conducts a comprehensive review of the history of Air C2, in which he identifies varying levels of centralization throughout a wide spectrum of historical operations. In doing so, Hinote

²⁶ Lt Col Clint Hinote, "Centralized Control and Decentralized Execution: A Catchphrase in Crisis?" (Research Paper 2009-1, Air Force Research Institute, Maxwell Air Force Base, Montgomery, AL, 2009), 1.

also brings to light the key lessons learned which were the genesis of the master tenet and demonstrates the Air Force's journey to find the right balance of centralization.

The most important such lesson was first learned in World War II. At the beginning of the conflict, Allied air forces were organized to be attached to land forces. This structure resulted in several divisions and separate chains of command across the air forces, a practice which was dubbed "penny packeting" by British Air Marshal Sir Arthur W. Tedder. It was quickly revealed that dividing air forces into "penny packets" disabled the very aspects of airpower that make it distinct from surface forces and decisive in combat. That is, airpower's strength lies in its ability to leverage its unique speed, range, and flexibility, to quickly achieve concentration and mass effects nearly anywhere on the battlefield. Dividing its organization and attaching it as subordinate to land forces made it all but useless; thus, the nascent tenet of centralized control of airpower was born. While this may seem indicative of a preference for more centralization than less, Hinote accurately points out that, for most of airpower history, this tenet was seen as flexible in that the appropriate level of centralization would vary depending on the specifics of any given operation, and that it should be adjusted accordingly. During the following forty-five years of Air Force history, this was the predominant interpretation of what would eventually become known as centralized control; however, things began to change with the commencement of Operation Desert Storm in 1991.²⁷

Hinote points to Desert Storm as the defining moment where the majority of airmen began to believe "the appropriate level of centralized control was the senior

²⁷ Hinote, "Centralized Control and Decentralized Execution," 7-12.

airman in-theater,”²⁸ meaning the Air Component Commander (ACC). This is a critical point. The implicit assumption is the overwhelming success the Air Force enjoyed during Desert Storm began the dogmatic thinking which now permeates the institution. Essentially, Desert Storm provided a blueprint for the single best way to conduct Air C2, and that blueprint is now so engrained in the Air Force’s culture, any other way of doing business is inconceivable to most. Furthermore, airmen today directly correlate the successful execution of CC/DE with the execution of air operations in Desert Storm. The result is an inflexible, narrow interpretation of a perceived “proper” application of CC/DE. This, in turn, hinders a more comprehensive view that encompasses the entire breadth of the historical purpose and evolution of CC/DE.

Another keen observation by Hinote is to identify doctrinal language as one of the primary reasons why CC/DE has experienced a troubled evolution. He specifically highlights how the definition and application of the terms “command” and “control” have been problematic for Air Force’s master tenet. Contrasting the influence of military historian Martin van Creveld with implications of the 1986 Goldwater-Nichols Act, Hinote exposes a significant tension between military thought and policy regarding command and control:

While van Creveld included in command everything a force needed to exist—that is, what we call organizing, training, and equipping—together with the things a force needed to conduct operations, the U.S. military was undergoing a fundamental reorganization that, in essence, separated these functions into two distinct chains of command. Goldwater-Nichols mandated that the services organize, train, and equip their forces, but the combatant commanders would direct operations with these forces. This meant that in the U.S. military the word

²⁸ Hinote, “Centralized Control and Decentralized Execution,” 7-12.

command would become a term full of nuance and qualification, because Goldwater-Nichols split van Creveld's concept in halves.²⁹

As a result, the term "control" has been used liberally to encompass a wide range of authorities that may or may not be directly tied to "command," causing frequent confusion about its meaning and application. Therefore, utilizing the term "centralized control" to describe the Air Force's master tenet is, in itself, unclear and problematic.

Finally, Hinote's piece does well to define what is meant by centralization of Air C2. He characterizes Air C2 in terms of four broad functions; planning, directing, coordinating, and controlling, and then asserts that airmen believe these four functions should be centralized at the theater level, under a single airman commander. This framework of centralized Air C2 is utilized by Hinote to analyze a series of operations in Iraq and Afghanistan, which clearly highlights several flaws in the "master tenet," or at least in its application at the time. While Hinote provides an excellent comprehensive analysis of the issues surrounding the Air Force's tenet of CC/DE, there are ideas presented and gaps in concepts that require further exploration for the purpose of this thesis.

The most glaring omission from *Catchphrase in Crisis* is analysis regarding how any enemy with the ability to contest the Air C2 construct impacts Hinote's conclusions. In Desert Storm, for example, the Iraqi enemy did not pose any real threat to the ACC's ability to generate airpower, plan air operations, or communicate with his forces; in other words, to command and control. This was certainly true of the insurgent enemies later faced in Iraq and Afghanistan as well. The result is a long list of lessons learned which

²⁹ Hinote, "Centralized Control and Decentralized Execution," 15.

are all predicated on the assumption that the ACC will be able to execute uncontested C2 of air forces. It is easy to see how changing that assumption would impact some of Hinote's conclusions. For example, he argues that operations in Iraq and Afghanistan would be good instances to utilize a more decentralized approach by delegating C2 to the forward commander. To support his argument, he leans on the actions taken by World War II General George Kenney, who was General MacArthur's air commander in the Southwest Pacific Theater during World War II, in what he calls a "similar situation."³⁰ Hinote goes on to conclude the Air Force needs a more flexible Air C2 construct. He further argues a distributed approach to control, as in the Kenney example, does not necessarily violate the master tenet of CC/DE as many airmen today believe it would.

However, when you consider Hinote's conclusions from a threat perspective, the Kenney comparison appears flawed. The nature of threat Kenney faced is much more analogous to large scale combat operations against a peer adversary, wherein the enemy has the capability to contest C2 of air forces, than it is to the conflicts in Iraq and Afghanistan. While Hinote's conclusions are still valid despite this shift in perspective, it is the "why" behind his conclusions that changes. Hinote's "why" was largely about better integration with joint partners for more effective and efficient operations. For this thesis, the "why" is about necessity. While *Catchphrase in Crisis* argues for a flexible Air C2 construct primarily for optimization, today's threat environment demands the same flexibility out of necessity. If the enemy possesses the ability to contest Air C2, then a highly centralized approach is no longer a feasible option.

³⁰ Hinote, "Centralized Control and Decentralized Execution," 70.

In many ways, *Catchphrase in Crisis* subtly captures the predominant military thinking at the turn of the century. That is, the era of great power competition had ended with the collapse of the Soviet Union and the armed forces of the United States of America would enjoy a considerable advantage over all potential adversaries for the foreseeable future. Therefore, it was reasonable to assume that advantages of the past would continue to be prevalent in future operations. But even then, there were several concerns. The Air Force's utilization of and reliance on technology coupled with commanding airpower in relatively benign or permissive environments had led to the development of a C2 system that was overly centralized. While this model had worked with devastating effect against inferior adversaries, it also created a vulnerability that could be exploited. Additionally, there were growing concerns about the Anti-Access, Area Denial (A2AD) systems being developed in Russia and China. As the new threat environment was slowly and reluctantly realized, flurries of articles regarding Air C2 began being published in prominent military journals. By 2013, even the highest-ranking generals in the Air Force were questioning the current application of the sacred tenet of CC/DE, and new concepts were emerging.

The Search for Solutions

Given President Obama's 2011 "Pivot to the Pacific" strategy³¹, it is no surprise that academic conversations within the military community began to shift away from

³¹ Mark E Manyin, Stephen Daggett, Ben Dolven, Susan V. Lawrence, Michael F. Martin, Ronald O'Rourke, and Bruce Vaughn, *Pivot to the Pacific? The Obama Administration's 'Rebalancing' Toward Asia*, Congressional Research Service Report for Congress (Washington, DC: Library of Congress, 2012), 33.

ideas dominated by counterinsurgency operations and towards concepts necessary to prevail in large scale operations against peer adversaries. As priorities shifted and the conversation evolved, many began to address the increasingly obvious problem the Air Force had with over-centralization and the search for solutions began. Within the air community, more leaders and thinkers began to suggest that the tenet of CC/DE should be adapted to address this issue. As an antidote to that perceived over-centralization, the concept gaining the most traction was one of “Distributed Control,” which was repeatedly suggested as an appropriate modification to the master tenet in the form of: “Centralized Command / Distributed Control / Decentralized Execution” (CC/DC/DE). The new concept was staunchly advocated by General Herbert Carlisle who, in 2013, went so far as to list CC/DC/DE as a replacement for CC/DE in the PACAF Command Strategy.³²

One year later, the Commander, Air Combat Command (COMACC), Gen Mike Hostage, together with his executive officer, Colonel Larry Broadwell, published an article in *Joint Force Quarterly* titled, “Resilient Command and Control: The Need for Distributed Control.” In this article, COMACC outlines the need for the Air Force to adopt CC/DC/DE as a necessary adaptation to the legacy tenet in order to meet the challenges of the contemporary threat environment.³³ He also lays out a clear picture of what is meant by distributed control, defining it as, “the conditional, adaptive delegation

³² Gen Herbert Carlisle, “Pacific Air Forces: Command Strategy” (PACAF/A5XC, January 2013).

³³ Hostage and Broadwell, “Resilient Command and Control,” 43.

or assumption of control activities through orders or protocols to synchronize operations, maintain initiative, and achieve commander's intent.”³⁴

The thoughts expressed by Hostage in this article are a marked departure from the small-scale conflict paradigm which drove the work of Hinote and others in the years before. Accordingly, Hostage's threat-centric argument regarding the need for distributed control and his vision for its utilization are both clear:

It is preposterous to believe any sophisticated future adversary would not possess at least the desire and, likely, the capability to disrupt our C2 architecture. Therefore, we must be prepared to synchronize and project combat airpower through distributed control during periods when our C2 architecture is strained by asymmetric challenges or saturated with intense air activity. If the Combined Forces Air Component Commander (CFACC) becomes isolated, the concept of distributed control empowers subordinate commanders, organizations, operations centers, and battle management command and control (BMC2) platforms to amalgamate otherwise disconnected units into teams of synchronized combat airpower.³⁵

Thus, while the idea for a flexible Air C2 construct is consistent with Hinote's thinking, the shift in threat perspective provides a more compelling purpose. Yet, the flexible approach to Air C2 is not the only place where Hostage and Hinote find alignment. They both also recognize the importance of empowering subordinate commanders by establishing broad commander's intent and setting the conditions for subordinate forces to maintain initiative. This alludes to a tried-and-true principle of military operations, well codified in joint doctrine, known as “mission command.”

Joint Publication 1: Doctrine for the Armed Forces of the United States, defines mission command as, “the conduct of military operations through decentralized execution

³⁴ Hostage and Broadwell, “Resilient Command and Control,” 39.

³⁵ Ibid.

based on mission-type orders,” and goes on to state that it is the preferred method of executing C2.³⁶ The joint doctrine publication which pertains specifically to airpower goes further to describe the relationship between mission command and the airpower tenet of CC/DE:

Mission command is the conduct of military operations through decentralized execution based upon mission-type orders and is a key component of the C2 function. Commanders delegate decisions to subordinates wherever possible, which minimizes detailed control and empowers subordinates’ initiative to make decisions based on the commander’s guidance rather than constant communications. While philosophically consistent with historical C2 of air operations, modern joint air operations demand a balanced approach to C2. This approach is best codified in centralized control and decentralized execution.³⁷

Thus, joint air doctrine seems to suggest that, while the two concepts are closely related, they are still distinct from one another, but this is not entirely clear. Perhaps in attempt to address potential confusion, Air Force doctrine further clarifies:

[Mission Command’s] intent is for subordinates to clearly understand the commander’s intent and to foster flexibility and initiative at the tactical level to best accomplish the mission. Decentralization of tactical planning via conditions-based or mission-type orders, combined with command by negation and accepting the appropriate level of risk, allows subordinate commanders to focus on the superior commander’s intent and required effects to accomplish the mission in an efficient manner. Joint education, planning, and training are required to develop and demonstrate professional competence based on doctrine and knowledge. This approach is best codified in centralized control and decentralized execution.³⁸

Restated succinctly, Air Force doctrine describes CC/DE as the Air Force’s approach to mission command in an attempt to make the two concepts one in the same. Yet, despite this attempt to bridge the two terms in theory, the contemporary manifestation of CC/DE

³⁶ CJCS, JP 1, V-15.

³⁷ CJCS, JP 3-30, I-3.

³⁸ DAF, AFDP 3-30, 71.

in practice does not appear to be well aligned with mission command at all. In fact, the Air Force's application of CC/DE often finds itself in direct conflict with the concept of mission command. Examples of this include reliance on an Air Tasking Order (ATO) versus mission-type orders, retention of authorities versus delegation of authorities, and subordinate commanders unable to exercise initiative due to the design of the current Air C2 system.³⁹ This is problematic considering that, in order to function in the threat environment outlined by Hostage, Air C2 will be dependent on an approach more akin to mission command for success.

Therefore, a large part of the philosophical struggle facing the Air Force is the ability to reconcile the tenet of centralized control with the principle of mission command. Furthermore, seeing as both concepts agree on the approach to "decentralized execution," the fundamental difference in application must come down to "centralized control" and the elusive task of finding the right balance. Given the previous definition of over-centralization, it can be concluded that the Air Force's current construct is widely perceived to be out of balance, investing far more in centralized control than in decentralized execution. As airpower thinkers began to work through these issues in the early 2010's, distributed control emerged as a promising concept to address the challenges at hand.

Like Hinote, Hostage also recognized the need to address the terms "command" and "control" individually; however, Hostage advocates a much different solution. While

³⁹ This argument is further developed later in this chapter and in Chapter 4. Additionally, the Air Force has several ongoing initiatives to address these issues which are discussed in Chapter 5.

Hinote recommends a more permanent delegation of authority to forward commanders as evidenced by his Kenney example, Hostage sees distributed control as a much more temporary arrangement during operations, only being utilized when the ACC loses communications with subordinate forces. Hostage goes further to draw a crisp line in the sand, stating, “Distributed control absolutely does not delegate command authorities or command responsibilities from the CFACC or a subordinate commander to another.”⁴⁰ He is very clear that any delegation of authority would be strictly limited to that of “control activities,” thereby creating a significant, if not confusing, distinction between command and control.

The confusion arises when one analyzes Hostage’s discussion of subordinate commander activities and roles during the execution of distributed control. Within the concept of distributed control, he sees delegated control authorities primarily being carried out by tactical C2 platforms such as the E-3 Airborne Warning and Control System (AWACS) or ground-based Control and Reporting Centers (CRCs). The discussion here is about delegation of control authorities to entities, not specific commanders. The role of subordinate commanders is only discussed in the context of “self-organization,” a concept which Hostage describes here:

It is even possible, if isolated for many days to weeks, for subordinate units to self-organize into larger, more comprehensive units using distributed control. Self-organization would only occur in the direst of circumstances and does not include modifications to the chain of command, leaving prehostility command authorities and responsibilities intact. Furthermore, any self-organization would remain under the command of the CFACC and should evolve as expressed in his mission intent orders about extended periods of lost communications. These new organizations could become as robust as an Air Expeditionary Task Force (AETF), thus husbanding resources from otherwise isolated units—fighters,

⁴⁰ Hostage and Broadwell, “Resilient Command and Control,” 39.

bombers, tankers, and intelligence, surveillance, and reconnaissance (ISR) aircraft—into a composite fighting force..⁴¹

Hostage reiterates that, in such a construct, there still would be no change to command authorities or responsibilities. Instead, it would be “control authorities” that the subordinate commander would be executing, all the while attempting to reestablish the pre-existing command structure. However, when critically examining what would be required of subordinate commanders in a period of self-organization (“husbanding resources” for example), it can be easily argued that these are actually “command authorities” being executed, even if they are labeled as “control authorities.” Thus, the conversation risks being reduced to a debate over semantics.

However, Hostage clearly feels it is necessary to highlight this distinction. He views it as essential that the ACC maintains the full authority and responsibility of his command, although he does not explicitly state why. One potential reason Hostage places so much emphasis on the retention of all aspects of command for the ACC is to safeguard against the known pitfalls of Air C2. As previously discussed, there are several valid reasons why air commanders would be distrustful of any C2 organization which risked return to a “penny packet” type structure. The forward commander construct that Hinote argues for can be interpreted as a division in command structure, and therefore the beginning of packeted air forces. Furthermore, it is typical for surface component commanders to desire their own dedicated air forces. The idea of having airpower on call, directly subordinate to one’s own objectives, is very appealing. Perhaps the concern of Hostage and other air commanders is that a forward commander construct presents too

⁴¹ Hostage and Broadwell, “Resilient Command and Control,” 39.

tempting of an option for surface commanders in a Joint C2 environment, in which it may be decided to attach such a forward commander to surface forces and subordinate to a surface commander. This would violate the known best practice for employing airpower; therefore, one prevents this from being an option by continuing to emphasize the primacy of the ACC and refusing to budge on any concept which may pose a threat to that idea. This would help explain why Hostage continually reiterates that distributed control is about the delegation of control authorities, not about the delegation of any aspects of command.

The final aspect of distributed control that merits further exploration is that of commander's intent and orders, thereby warranting a brief return to the discussion of mission command. As previously mentioned, the concept of mission command is built on mission-type orders, which are codified in joint doctrine as follows:

Mission-type orders direct a subordinate to perform a certain task without specifying how to accomplish it. Within these orders, the actual mission statement should be a short sentence or paragraph that describes the organization's essential task (or tasks) and purpose—a clear statement of the action to be taken and the reason for doing so. The senior leaves the details of execution to the subordinate, allowing the freedom and the obligation to take whatever steps are necessary to deal with the changing situation while encouraging initiative at lower levels.⁴²

Herein lies another significant issue that Hostage alludes to with the concept of distributed control; an issue somewhat unique to Air C2 when compared to the other components. The problem lies in the high level of synchronization demanded by modern air operations. The ACC must find a way to align the activities of hundreds, if not thousands, of aircraft launching from multiple bases across the theater, and to converge

⁴² CJCS, JP 1, V-16.

all the effects produced by those aircraft to achieve the objectives of the broader joint campaign. This extremely complex endeavor has traditionally been accomplished by the commander issuing an Air Tasking Order (ATO), which is “a method used to task and disseminate to components, subordinate units, and command and control agencies projected sorties, capabilities, and/or force to targets and specific missions.”⁴³ Of note, the ATO is a very specific and detailed order and, in some ways, is the antithesis of mission-type orders

When assessed in the modern threat environment as outlined by Hostage, the problem with the Air Force’s current ATO process is that it is a cumbersome, single point of failure. To illustrate this point, consider ATO production and dissemination. First, the ATO is typically produced every 24-hours; it is a very specific and detailed order which requires high-levels of planning and a large staff. Accordingly, the ACC utilizes the capabilities of the AOC for ATO production. Second, the ATO must be delivered to subordinate units, a process dependent on a consistently functioning communication network. In a modern peer conflict, it is not difficult to envisage a scenario in which the AOC comes under attack, be it via non-kinetic means such as a cyber-attack, or via kinetic means such as a missile attack. Any such attack would clearly degrade, if not outright deny, the ability of the AOC to produce the ATO. Furthermore, in a scenario where the AOC becomes isolated from subordinate units in terms of communications, or where units may be isolated from the AOC, the ATO cannot be delivered. Stated simply, units would not receive orders. These issues become even more worrisome when

⁴³ CJCS, JP 1, GL-6.

considering the need to deliver an ATO every 24 hours; disruptions to the ATO process would have ripple effects and become exponentially impactful over time. This exercise in logic clearly demonstrates the need for the Air Force to develop a more agile and resilient means to produce and deliver orders to prevail in peer conflict.

To address this issue, Hostage and others suggest ideas mirroring the concepts of mission command, that is, a concept founded on the ability of subordinate forces to maintain the initiative enabled by the broad issuance of commander's guidance and communicated through mission-type orders. As Hostage explains, "the ability to maintain initiative and act in the throes of combat is key to putting combat airpower over friendly forces or taking it to the enemy . . . to enable this initiative, the commander must have clearly expressed his intent to subordinate commanders and their units."⁴⁴ He stops short of directly referring to this element of the distributed control concept as mission command, however, the similarities are clear. Additionally, while he never uses the words "mission-type order," he does propose the ACC should be able to issue a series of "preplanned ATOs covering several days."⁴⁵

Doctrine is also beginning to address the ATO problem. The most recent edition of Air Force Doctrine Publication 3-30, *Command and Control*, adds a single-paragraph section titled "Control of Airpower in Contested Environments," in which it introduces a concept labeled as a standing Integrated Tasking Order (ITO):

In this air equivalent of mission command, forward based air expeditionary wings or task forces receive conditions based authorities with standing orders and commander's intent on the ITO . . . This decentralized execution model enables

⁴⁴ Hostage and Broadwell, "Resilient Command and Control," 41.

⁴⁵ Ibid., 39.

local commanders to maintain pressure on the enemy even when disconnected from communications with higher headquarters due to a contested environment against a peer or near-peer adversary.⁴⁶

While the notion of an ITO shows promise, it is clearly a nascent concept that is only beginning to be understood in the air community. Execution of a standing ITO versus a traditional ATO would be a dramatic departure from the Air Force's current way of doing business. It is not currently clear if the Air Force is organized, trained, or equipped, to deliver orders in such a manner, much less if it can do so as a means to successfully conduct air operations in a peer conflict. Regardless, the point remains, if the Air Force is to fight and win in peer conflict, it must adapt its current ATO construct.

In summary, this section of the literature review has established that the current organization of Air C2 is widely perceived to be overly centralized, a problem which arose out of a misunderstanding, if not a misapplication, of the airpower tenet of CC/DE. The highly centralized structure of Air C2 is problematic for a multitude of reasons, not the least of which is the threat posed by emerging peer competitors. As a result, the air community has been in search of solutions to find the appropriate balance of centralized control which would better enable a mission command type of approach. Emerging concepts such as distributed control and standing ITOs offer promise but warrant further exploration. To further shed light on this discussion, it is necessary to understand what assumptions fundamentally change when an adversary possesses the capability to contest Air C2.

⁴⁶ DAF, AFDP 3-30, 3.

Air C2 in Contested Environments

When determining the need for change to a system as successful as Air C2 has been in recent decades, it is necessary to have a thorough understanding of what drives the need for change. In this case, the reason is simple; for the first time since the end of the Cold War, the United States has recognized the existence of potential adversaries who possess the capability to contest the command and control of air forces. This section explores the theme and relevant literature regarding Air C2 in contested environments. First, it is necessary to establish a baseline for discussion as to what is meant by “contested environments,” then the implications of that environment can be further examined.

The Air Force’s existing Air C2 architecture is dependent on two essential elements that enable the system to function: persistent communications and sanctuary of forces. Communication is, of course, inherent in and essential to any form of C2. Commanders must be able to communicate with subordinate forces, though communications may vary in frequency, duration, and detail. Modern military operations offer many means of near-instantaneous communications including line of sight (LOS) radio, high frequency (HF) radio, satellite communications (SATCOM), datalinks, fiber, and internet-based communications, to name a few. The Air Force, along with the rest of the United States military, has enjoyed a significant period of dominance regarding such communications technologies, wherein commanders have consistently achieved high levels of connectivity with subordinate forces against adversaries who were powerless to prevent it. Similarly, the Air Force has benefited tremendously in recent decades from the sanctuary of its forces. In the majority of U.S. conflicts since World War II, air

commanders have been able to mass forces in theaters of operations with near impunity. Indeed, while smaller-scale attacks have occurred, the legitimate threat of a large-scale attack has been absent since the end of the Cold War. Additionally, air commanders themselves, their staffs, and the AOC, have largely been able to operate out of reach of the enemy.⁴⁷ For the purposes of this thesis, the term “contested environment” is used to describe an operational scenario in which the adversary possesses the capability to degrade or deny both of these essential elements which enable the current Air C2 system.

To better understand the current situation, a brief discussion of historical precedence is warranted. In a book titled *Joint Air Operations: Pursuit of Unity in Command and Control, 1942-1991*, authors James Winnefeld and Dana Johnson offer an excellent starting point. In this work, Winnefeld and Johnson conduct a thorough review of six major air campaigns from World War II to Desert Storm, identifying major historical lessons learned in the joint application of Air C2. In analyzing the World War II Solomons Campaign in the Pacific theater, Winnefeld and Johnson observe:

First, it must be said that survival and the desire to win when the issue is in doubt are major incentives to put lesser concerns aside . . . The enemy contested control of the air over the battlefield until late in the campaign. Air commanders have not faced similar challenges in subsequent wars. In the Korean and Vietnam wars U.S. airfields and naval forces were not under air attack, and the staffs were themselves seldom threatened. In the Solomons, everyone in the islands was under threat of attack at any time.⁴⁸

⁴⁷ A notable exception are those forces in range of missile threats posed by Iran and North Korea during periods of heightened tensions in recent years.

⁴⁸ James A. Winnefeld and Dana J. Johnson, *Joint Air Operations: Pursuit of Unity in Command and Control, 1942-1991*, A RAND research study (Annapolis, MD: Naval Institute Press, 1993), 34.

It is difficult to overstate the significance of one historical fact that this excerpt highlights—no enemy has contested U.S. Air C2 since World War II.

This point presents several challenges when considering best practices. First, there is an extremely limited well to draw from when searching for examples of what has worked in the past. Lessons drawn from conflicts such as Korea, Vietnam, and the first Gulf War, are foundational to modern airpower, but many lessons learned from those conflicts would likely change had the enemy been able to significantly contest Air C2. Second, institutional memory of how to operate in such an environment atrophies over time. While the study of history and doctrine can serve as a means to hold onto portions of institutional memory, they are no substitute for widespread individual experience of those in the force. Third, the historical examples that do exist struggle to stand up to criticisms of relevance. Airpower and its associated technologies have advanced tremendously in the seventy-five years since the end of World War II, making it imprudent to draw direct correlations between Air C2 then and now.

But there are a few enduring truths that are still germane to current and future operations. To begin, the previous point that communication is an essential element of Air C2 can be observed from a historical perspective. As one of the major findings of their work, Winnefeld and Johnson point out, “communications are the known Achilles’ heel of any military operation, but particularly of a joint air operation.” This perspective is shared more recently by then Lt Col Francisco Gallei in his dissertation titled *The Roots of the Command and Control of Air Power: An Appraisal of Three Air Forces Through 1945*. After an in-depth study of the contestation of airpower during World War II, Gallei concludes:

Sometimes it appears as if the concept is new; and it is for this generation. WWI and WWII, however, were ‘contested environments,’ both in the air and on the ground, and nations developed command and control systems to operate in those environments. It was a way to orchestrate and provide order for the commander to respond to battlefield events. Belligerents attacked each other’s command and control system by intercepting radio transmissions and jamming radio and radar. Each side countered with a myriad of methods in order to continue operating. Command and control relies on a communications infrastructure. To be effective, air forces require a command and control system that is robust, redundant, and protected.⁴⁹

Here, Gallei not only reinforces the importance of communications, but he also highlights the need for Air C2 to be “robust, redundant, and protected” in contested environments.

While current-day Air C2 is certainly robust, evidence to this point suggests that it is highly centralized instead of redundant, and vulnerable versus protected. Gallei also seems to suggest that Air C2 in World War II naturally evolved as part of an iterative process; a series of attacks and counterattacks between belligerents that required each side to make adjustments until a workable solution was found. It is reasonable to believe that such a process would also occur in future conflicts between peers, which emphasizes the need for an Air C2 system that is flexible enough to adapt to rapidly changing circumstances during combat.

In addition to looking to the past for insights, it is also necessary to accurately envision how warfare will be different in the future, a task which has proven difficult to achieve for military thinkers throughout history. Nineteenth century Prussian general Helmuth von Moltke offers a rare example of success in this endeavor. During a period of relative peace, Moltke was able to intellectually synthesize significant changes in

⁴⁹ Lt Col Francisco M Gallei, “The Roots of the Command and Control of Air Power: An Appraisal of Three Air Forces through 1945,” (Ph.D. diss., Air University, Maxwell Air Force Base, Montgomery, AL, 2014), 380.

technology, weaponry, communications, and logistics, to arrive at a prescient vision of what future war would look like. Unfortunately, his belief that future conflicts would be long and devastating total wars proved to be true in World War I, albeit on a much more horrific scale than anyone could have predicted.⁵⁰ While Moltke may have been able to correctly predict certain aspects of future warfare, history is littered with many more military thinkers who were unable to do so.

So, the challenge today, once again during a period of relative peace between great powers, is to arrive at the best possible approximation of future warfare and prepare for it, not just to fight and win if necessary, but ideally to deter and prevent. A recent RAND study published in 2018 is a good focal point for this discussion. *Distributed Operations in a Contested Environment: Implications for USAF Force Presentation* is an in-depth study of the impacts of the modern threat environment on existing Air Force structures. The first finding of the study addresses the two Air C2 essential elements of communications and sanctuary:

The U.S. Air Force force presentation model and operating concepts are based on assumptions that are incompatible with a contested environment. A conflict with a great power will overturn two key assumptions about the operating environment that have prevailed during counterinsurgency (COIN), counterterrorism (CT), and stability operations in recent decades: that air bases are sanctuaries and communications reliable. In this setting, wing-sized units at main operating bases and centralized planning at the JAOC mean that the enemy could disrupt air operations with attacks on a few high-payoff targets.⁵¹

⁵⁰ Michael Krause, *Historical Perspectives of the Operational Art* (Washington: Center for Military History, 2005), 113.

⁵¹ Miranda Priebe, Alan Vick, Jacob Heim, and Meagan Smith, *Distributed Operations in a Contested Environment: Implications for USAF Force Presentation* (RAND Corporation, 2019), x, accessed November 7, 2020, https://www.rand.org/pubs/research_reports/RR2959.html.

This finding alludes to two broad characteristics that will likely be present in future conflicts. First, in peer conflict, traditional notions of sanctuary no longer exist. Just as the Air Force has touted “global reach” as a strategic effect of airpower,⁵² inherent in the nature of a peer competitor is that they also possess a degree of global reach, even if it is asymmetric to U.S. notions of the concept. Cyber capabilities, anti-space capabilities, long-range missiles, and submarines, are just a few of the means available to potential adversaries to deny any traditional notion of sanctuary via geographic location alone. Therefore, in future conflicts, it should be expected that air forces will be attacked and the Air C2 system should be designed to account for this inevitability. Second, the communication environment will be chaotic. Potential adversaries have been observing how the Air Force has been able to use exquisite communications technology to devastating effect, and they have developed several means to degrade or deny it. Successful Air C2 in future warfare will be predicated on the ability to continue operations in a communication degraded or denied environment. These two characteristics of future conflict and their impact on the Air C2 system are significant factors for analysis in Chapter 4.

Summary

What this chapter reveals is a growing consensus amongst the air community that the current design of the Air C2 system is over-centralized, due in large part to the slow devolution of CC/DE from a flexible tenet into a rigid dogma. This devolution was the

⁵² Department of the Air Force (DAF), *Global Vigilance, Global Reach, Global Power for America*, 2013, 10, https://www.af.mil/Portals/1/documents/af%20events/2015/newGV_GR_GP_PRINT.pdf.

logical outcome of the circumstances in which air operations have been conducted for the past 75 years—The U.S. Air Force’s ability to conduct C2 has not been truly contested since World War II. Furthermore, following the collapse of the Soviet Union and the end of the Cold War, the U.S. has enjoyed a long period of unipolar world order, during which the Air Force possessed a significant technological advantage relatively unrivaled by adversaries. The conditions were set for the Air Force to naturally walk down a path towards an ever more centralized approach to Air C2.

Yet in recent years, U.S. national strategy has recognized the emerging era of a multipolar world order and a return to great power competition. Consequently, the likely characteristics of future warfare dictate the need for Air C2 that can persist in contested environments. Despite the narrow window of historical precedence, a few enduring lessons for contested air operations are apparent: communications are essential to Air C2; Air C2 should be robust, redundant, and protected; and Air C2 must be flexible enough to adapt when attacked. Moreover, traditional notions of sanctuary will be denied to air forces and communications environments will be unpredictable.

When considering these points in their totality, it is clear contested environments fundamentally change the underlying assumptions on which current Air C2 structures are built. As a result, the Air Force must make significant changes to ensure Air C2 can continue to deliver decisive airpower in future conflicts. Senior leaders and strategic thinkers have recognized this need and have been willing to reconsider traditional approaches to Air C2 in search of better answers. Promising concepts such as distributed control and standing ITOs have emerged as a result, but many changes are still needed if Air C2 is to be successful in future operations. The challenge is to achieve a more

appropriate balance of centralization in Air C2 without abandoning the principles which have made airpower so effective for the joint force. This thesis hopes to address a very specific piece of that equation with a thorough analysis of the relationship between the AOC and the Wing.

CHAPTER 3

RESEARCH METHODOLOGY

It is ever a paradox in military affairs that the only way to obtain license for intellectual ideas is to prove oneself an expert in conventional practices.

—B.H. Liddell Hart, *Thoughts on War*, quoted in “Quotations on Airpower”

Introduction

The aim of this thesis is threefold: 1) execute in-depth research and analysis of air Command and Control (C2) theory, doctrine, and practice; 2) identify how its current structure might be exploited by a peer adversary, and; 3) propose organizational solutions to overcome some of the challenges posed by peer conflict. To meet this aim, the author conducted a Qualitative Case Study of Air C2, using systems theory as a theoretical framework. The study focuses on how the Air Operations Center (AOC) and the Wing function as an organizational Air C2 system to deliver effects in combat operations against a peer adversary.

Methodology

As described in Chapter 1, this study was conducted to develop a detailed understanding, to provide and assess recommendations, and to provide input into the ongoing conversation. In comparison, there are four primary characteristics of qualitative research: 1) a focus on meaning and understanding; 2) the researcher as the primary instrument of data collection; 3) it is an inductive process, and; 4) the product results in rich description.⁵³ There is, therefore, significant alignment between these characteristics

⁵³ Merriam and Tisdell, *Qualitative Research*, 14-19.

and the purpose of this study. Additionally, this study was intended to be descriptive and understanding in nature, as opposed to a quantitative approach which seeks to be predictive and controlling.⁵⁴ Thus, the purpose of this study demanded a qualitative approach.

Acknowledging that there are numerous ways to design qualitative research, this thesis utilized the Case Study Method. A case study can be defined as, “an in-depth description and analysis of a bounded system.”⁵⁵ In this research project specifically, the “case” is “Air C2” as a system, bounded by the interaction of two entities, the AOC and the Wing. The system is characterized in Chapter 4 by functional analysis, through which the author breaks each entity down by organization and subsequently into a comprehensive list of functions that are performed to generate Air C2. The sources of information regarding functions were derived from regulation, joint doctrine, Air Force doctrine, Air Force publications, and a series of semi-structured interviews with subject-matter experts (SMEs). The primary and secondary research questions were used to scope this process.

Additionally, this research project uses systems theory as a theoretical framework, meaning “the focus is on the interactions and on the relationships between parts in order to understand an entity’s organization, functioning and outcomes.”⁵⁶ The author utilizes

⁵⁴ Merriam and Tisdell, *Qualitative Research*, 20.

⁵⁵ Ibid., 37.

⁵⁶ Cristina Mele, Jacqueline Pels, and Francesco Polese, “A Brief Review of Systems Theories and Their Managerial Applications,” *Service Science* 2, no. 1–2 (June 2010): 127.

functional analysis to characterize Air C2 as a system. This approach is accomplished by describing the functions in terms of the processes and relationships required to perform those functions. Once established, the system is graphically depicted to enable visualization of the system. This visualization utilizes links, which are established between the AOC, the Wing, requisite functions, and the other elements of system, to depict how the organizational processes interact to generate Air C2. Then, the final step of the system analysis is to assess how it reacts to a contested environment. To do this, a threat to the system must be identified.

This project is focused Air C2 in peer conflict; therefore, a threat to the Air C2 system are capabilities possessed by a peer adversary. To ensure the research is applicable to a broad range of potential future threats, no specific country is discussed. Instead, in Chapter 4, the author develops a country-agnostic list of broad capabilities that might disrupt, degrade, or deny certain aspects of the current Air C2 system. A “peer adversary” is then defined as a notional state actor which possesses those capabilities. Once the threat is defined as such, peer adversary capabilities are applied against the system to demonstrate how Air C2 responds to the threat.

Last, acknowledging that form should function, the author leverages the functional and system analysis to arrive at organizational solutions to the problem observed. This final step is asking, “if certain functions of the system are being disrupted or denied by the threat, what organizational change(s) to the AOC and/or Wing would allow the system to continue to function?” The organizational solutions recommended are intended to be achievable by the Air Force on a relatively short timeline, defined as less than two years, and independent of any material solutions. The reasoning for this non-

material approach to recommendations is grounded in the belief that immediate solutions to the Air C2 problem are required and can be achieved, at least partially, outside of the problematic acquisition system.

Data Collection

This study collected data and amassed evidence through a combination of document analysis and semi-structured interviews. The document analysis included published articles, peer-reviewed studies, or other scholarly works as they pertain to the primary and secondary research questions. Document analysis also incorporated Department of Defense (DOD) documents, including joint doctrine, Air Force doctrine, and Air Force Instructions (AFIs). Key topic areas for data collection were Air C2, the AOC, the Wing, national strategy, peer threat capabilities, and large-scale combat operations.

Interviews were required to gather several aspects of data not available through document analysis alone. First, interviews were instrumental to being able to ascertain the real-world practice of the processes and procedures described in doctrine and AFIs; to verify what is done against what is written. Additionally, interviewees were particularly critical to determining what unwritten capabilities exist at the Wing level. Last, interviews with Air C2 SMEs were essential in determining what on-going Air Force initiatives exist which may also address the problem as stated in this thesis.

For the interviews, data was collected utilizing a pre-determined list of questions and issues developed by the author to guide a discussion with the interviewees. To document the data, interviews were recorded and transcribed. The population for data collection via interview included Air C2 SMEs and Wing SMEs. This study used two

screening criteria to ensure the contributions of interviewees were relevant to the research. First, if providing information about current practices, subjects must have had recency of knowledge, defined as within the last two years. Second, if providing information as an SME, subjects must have had at least three years of experience with the applicable topic.

The interviewee data sample was developed utilizing chain sampling, which is a nonprobability, purposeful approach to data collection. *Nonprobability sampling*, as opposed to probabilistic sampling, is aimed at “discovering what occurs, the implication of what occurs, and the relationships linking occurrences,”⁵⁷ and is the standard approach to sampling for qualitative research.⁵⁸ The primary method of nonprobability sampling is known as *purposeful sampling*, which “is based on the assumption that the investigator wants to discover, understand, and gain insight and therefore must select a sample from which the most can be learned.”⁵⁹ *Chain Sampling*, also known as Snowball or Network Sampling, is a strategy that targets a few key participants who meet the screening criteria, then asks each subject for a follow-on reference to be interviewed.⁶⁰ This process continues to increase the sample until it reaches the appropriate size. As is typical for qualitative research, this project did not have a pre-identified number regarding the

⁵⁷ Merriam and Tisdell, *Qualitative Research*, 96.

⁵⁸ Ibid.

⁵⁹ Ibid.

⁶⁰ Ibid., 98.

sample size.⁶¹ The data sample culminated once saturation was achieved, meaning data collection concluded once the required data had been collected and the data itself had become redundant.

The data collected, both by document analysis and interview, was analyzed to develop an expert understanding of Air C2 functions, to characterize those functions in terms of a system, to understand the relationships and processes within the system, and to understand how the system functions as a whole. Data was also analyzed to characterize threats to the system. The data collected is depicted in Chapter 4 through text and various figures, including a visual representation of Air C2 as an organizational system. The combination of document analysis and interviews is intended to increase the precision of the research and add credibility to the results.

Ethical Assurances

To protect the interviewees participating in this project, strict professional and ethical guidelines were adhered to. An informed consent document was issued to all potential participants. This document outlined key aspects of the research, identified potential risks to participants, offered confidentiality if desired, and highlighted the voluntary nature of participation. Both the researcher and participants signed the informed consent document prior to data collection.

⁶¹ Merriam and Tisdell, *Qualitative Research*, 101.

Summary

The author's thesis is a Qualitative Case Study of Air C2. The research design utilizes systems theory as a theoretical framework for analysis by depicting the functions of the AOC and the Wing as an organizational system that produces Air C2. Threats to the system were identified by developing a country-agnostic list of capabilities that define a "peer adversary." This framework for analysis drove the data collection methods of document analysis and semi-structured interviews. The author utilized a Chain Sampling strategy to collect data from interviewees. Strict professional and ethical guidelines were followed to ensure protection of the interviewees. This methodology was designed to support the ultimate goal of the research, which is to provide potential solutions to the stated problem in the thesis.

CHAPTER 4

ANALYSIS

To win, you must decide what you want your tomorrow to be, and then make it happen faster than the rate of change in your competitive environment.

John A. Warden III, *Winning in FastTime*

Introduction

This chapter provides a foundation for analysis by first answering the secondary research questions (SRQs) listed in Chapter 1. The author then synthesizes the discussion in Chapter 2 with the answers to the SRQs by performing a functional analysis of Air Command and Control (C2). This analysis enables a clear understanding of what it means to C2 airpower. Finally, the results of the functional analysis are used to characterize Air C2 as a system. This depiction demonstrates how the system functions, or ceases to function, in the face of threats posed by a peer adversary. The culmination of analysis ultimately provides insights to the primary research question and allows the author to provide recommendations in Chapter 5.

The AOC

This section of analysis answers thesis SRQ 1: “How is the AOC currently organized and what are the key functions the AOC must perform that drives that organization?” In doing so, it is important to note that the AOC was not developed in a vacuum. That is to say, the AOC the product of decades of organizational and institutional changes primarily targeted to address Air C2 problems. Therefore, before the present state of the AOC is discussed, it is necessary to briefly cover its background to provide the broader context of its development.

The two world wars that immediately followed the advent of powered aviation were the forge in which combat airpower was molded. By the end of World War II, major airpower lessons had been identified and tenets developed, many of which are still prevalent in how airpower theory and doctrine are taught today. As discussed in Chapter 2, the primary lesson regarding Air C2 was captured in a tenet which would eventually become known as Centralized Control and Decentralized Execution (CC/DE) of air operations by a single airman commander. The conflicts that followed in Korea and Vietnam demonstrated the struggles of the Air Force as it determined how best to organize for such an approach, a problem that was compounded by the continual relearning of old lessons.⁶² During this timeframe, the Air Force developed the Theater Air Control System (TACS) to provide C2 of air assets. Within TACS, one of the primary C2 nodes was known as the Tactical Air Control Center (TACC), of which there could be multiple within a single theater of operations.⁶³ Following Vietnam, a series of reforms took place leading to the eventual transformation of the TACC into the AOC—a single operational C2 entity commanded by a single airman commander. Following the tremendous success of the AOC in Desert Storm, then Air Force Chief of Staff, General Michael Ryan, officially dubbed the AOC a “weapon system,” a moniker usually reserved for platforms such as aircraft and one that enabled the AOC to become the new

⁶² Joseph H. Justice III, “Airpower Command and Control: Evolution of the Air and Space Operations Center as a Weapon System,” (Master’s thesis, US Army War College, Carlisle Barracks, PA, 2004), 4, accessed January 20, 2021, <http://www.dtic.mil/docs/citations/ADA423705>.

⁶³ Ibid., 3.

standard of operational Air C2 across the Air Force.⁶⁴ This significant declaration marked the beginning of the institutionalization of the AOC as it is now known.

Today, descriptions of the AOC and its purpose, capabilities, and organization, can be found in many different official documents.⁶⁵ While there is decent alignment between these publications, it is noteworthy that there have been significant revisions in recent years as the Air Force attempts to address known problems, incorporate emerging concepts, and adapt to institutional changes such as the creation of the United States Space Force. It is not inconsequential that many of these documents have been revised within the last two years, perhaps the most significant of which is DAFMAN 13-1AOC, the document that supersedes the previous Air Force Instruction (AFI) 13-1AOC, not revised since 2011. The pace and rapid succession of these revisions are likely to blame for inconsistent discussion of emerging concepts therein; however, it is also indicative of the Air Force's sense of urgency regarding change.

Despite these considerations, a coherent picture of the AOC across publications remains. JP 3-30 describes the AOC as “the senior C2 element of the TACS and includes personnel and equipment of necessary disciplines to ensure the effective planning and conduct of component air and space operations.”⁶⁶ Additionally, the AOC “should be manned with subject-matter experts who reflect the capabilities/forces available to the JFACC” with the “capability to plan, coordinate, allocate, task, execute, monitor, and

⁶⁴ Justice III, “Airpower Command and Control,” 6.

⁶⁵ See CJCS, JP 3-30; DAF, AFDP 3-30; DAF, DAFMAN 13-1.

⁶⁶ CJCS, JP 3-30, II-9.

assess the activities of assigned or attached forces.”⁶⁷ While both doctrine and regulation acknowledge that each AOC will be somewhat unique in that they are all tailored to fit its specific Area of Responsibility (AOR), there is also an agreed-upon baseline structure.

As described in Joint doctrine:

JAOC organizations may differ. Elements that should be common to all JAOCs are the strategy division (SD); combat plans division (CPD); intelligence, surveillance, and reconnaissance division (ISR/D); air mobility division (AMD); and combat operations division (COD). Divisions, cells, or teams within the JAOC should be established as needed.⁶⁸

Air Force doctrine further explains, “Each [division] integrates numerous disciplines in a cross-functional team approach to planning and execution.”⁶⁹ A visual depiction of this organization is provided in Figure 1.

Finally, in analysis of the AOC, the Air Force Forces (AFFOR) staff also warrants discussion. Although the two are technically separate entities, their roles are inextricably linked as it is the collective product of their efforts that truly enables Air C2 for the ACC.⁷⁰ The combination of the AOC and the AFFOR staff is referred to holistically as the air component staff. To understand how the air component staff can be arranged to support the ACC, Air Force doctrine describes two primary options which are depicted in Figure 2; either the AOC is operationally aligned as a part of the AFFOR Staff A-3, or it

⁶⁷ CJCS, JP 3-30, II-14.

⁶⁸ Ibid., II-14-15.

⁶⁹ DAF, AFDP 3-30, 56.

⁷⁰ Department of the Air Force (DAF), Air Force Instruction (AFI) 13-103, *Air Component Headquarters AFFOR Staff Operations, Readiness and Structures* (Washington, DC: DAF, 2020), 4.

is a separate entity which coordinates horizontally with the AFFOR staff. In either case, it is clear the AOC depends heavily on its integration with the AFFOR staff, and while it is not the focus of this research, it is important to note that any analysis of the AOC or resulting recommendations are inevitably tied to implications for the AFFOR staff.

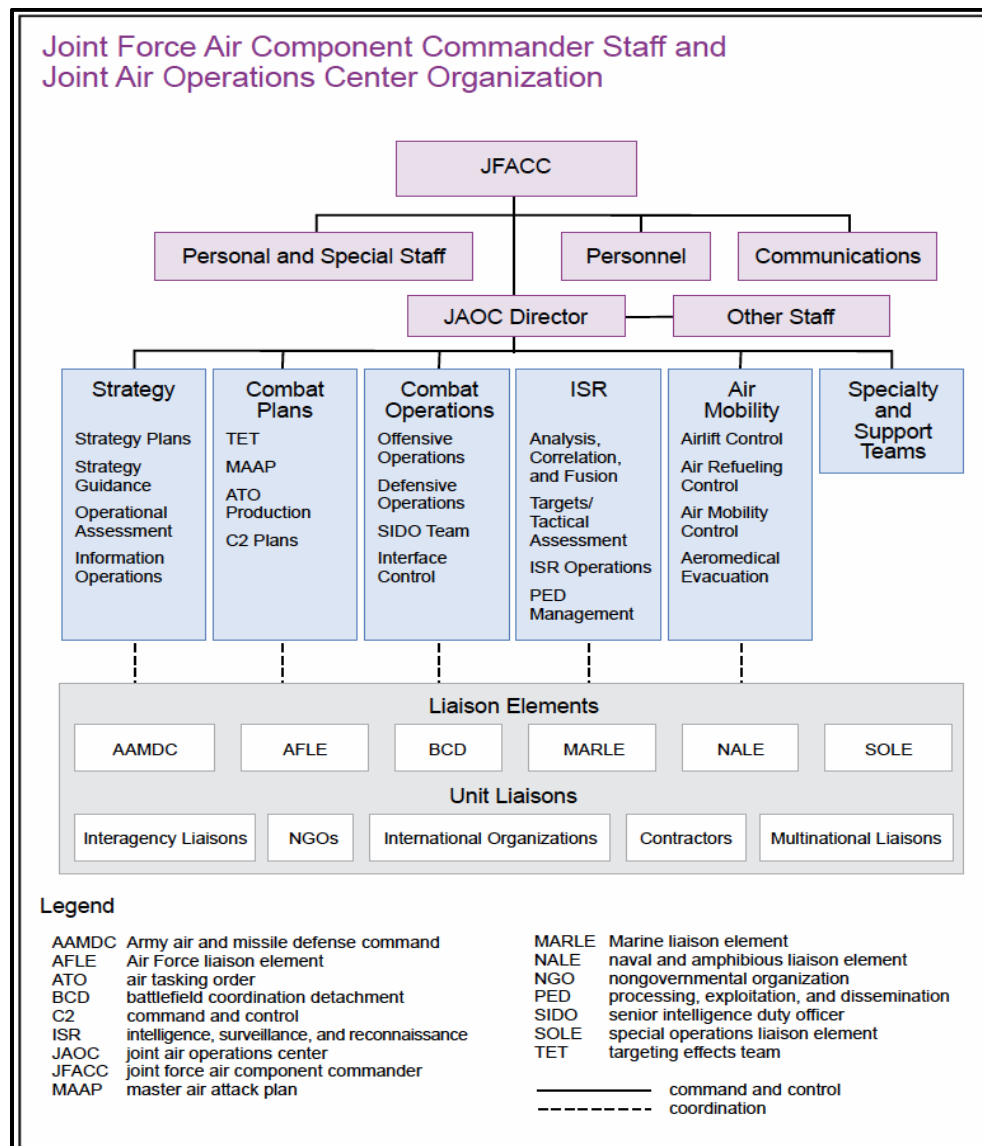


Figure 1. JFACC Staff and JAOC Organization

Source: Office of the Chairman of the Joint Chiefs of Staff (JCS), Joint Publication 3-30, *Joint Air Operations* (Washington, DC: JCS, 2019), E-2.

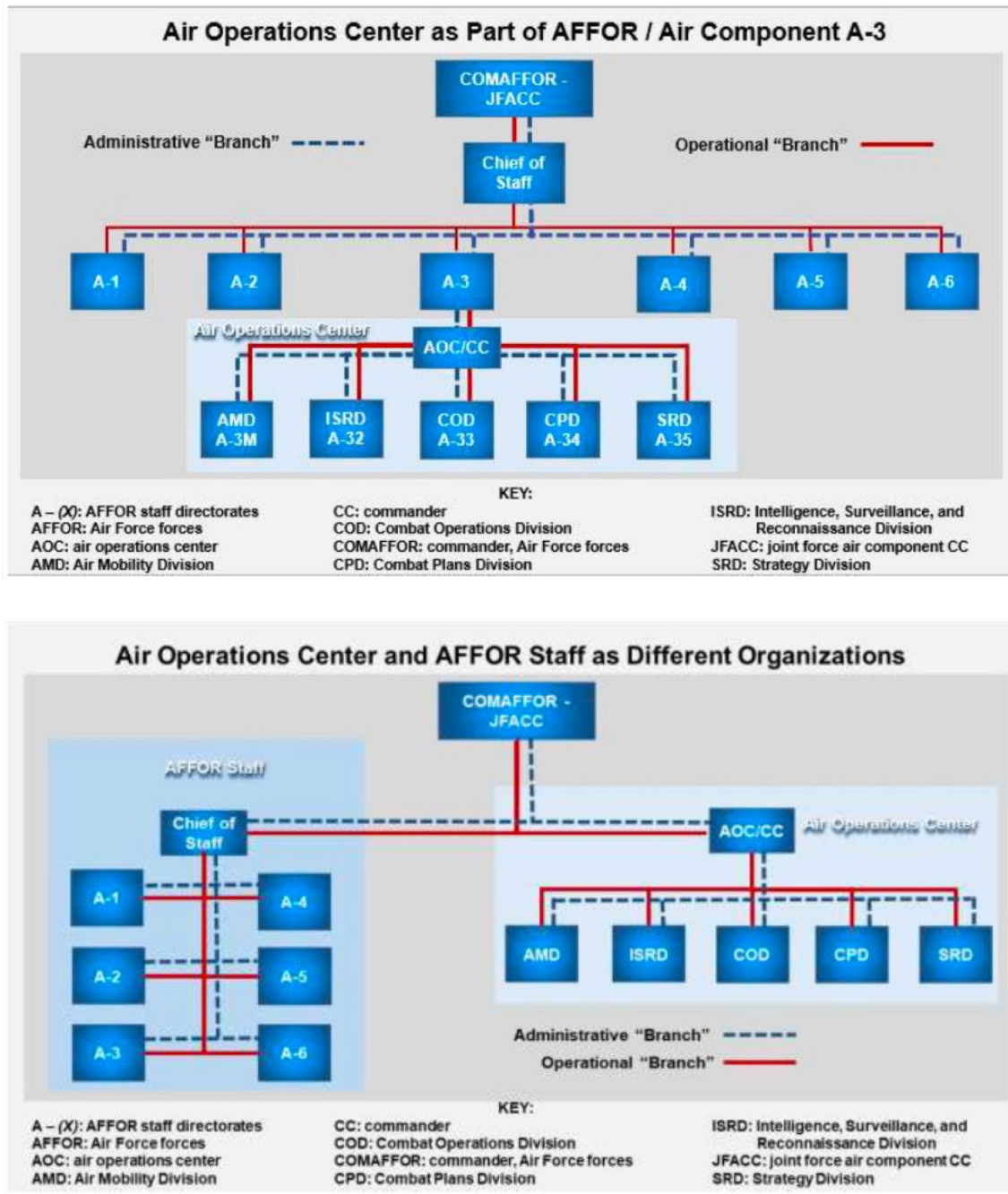


Figure 2. AFFOR Staff and AOC Organization

Source: Department of the Air Force, Air Force Doctrine Publication 3-30, *Command and Control* (Maxwell Air Force Base, AL: Curtis E. Lemay Center for Doctrine Development and Education, 2020), 50.

The Wing

The next piece of analysis answers SRQ 2: “How is the Wing currently organized and what are the key functions the Wing must perform that drives that organization?” As outlined in Chapter 1, this thesis focuses specifically on Operational Wings which possess the requisite assets to produce air effects during joint operations. To clarify this distinction, it is necessary to further explore different ways in which Wings may be categorized. In addition to being Operational, Base, or Specialized Mission, Wings may also be characterized as in-garrison or expeditionary.

In-garrison Wings are those permanently assigned to a specific base or group of bases. During normal times, they are typically subordinate to a Numbered Air Force (NAF) for the day-to-day activities of organizing, training, and equipping, and each NAF is subordinate to a Major Command (MAJCOM). The focus and composition of each in-garrison Wing are going to be closely tied to that of its parent MAJCOM. For example, in-garrison Wings assigned to United States Air Forces Europe (USAFE) are likely to be organized, trained, and equipped to address the challenges posed by the European AOR. In contrast, in-garrison Wings located in the continental United States (CONUS) might not be assigned to any particular AOR, and instead, prepare for a wide range of possible deployments or contingency operations.

Expeditionary Wings, on the other hand, are a type of Air Force provisional unit, formally known as Air Expeditionary Wings (AEWs). They are established in support of specific contingency or exercise operations⁷¹ and typically operate from deployed

⁷¹ DAF, AFI 38-101, 151.

locations. An AEW may be formed around a primary force provider, such as existing in-garrison Wing, or it may be comprised of multiple subordinate units which come from various force providers as is the case in U.S. Air Forces Central Command (AFCENT). Thus, AEWs are intended to be modular, flexible, and temporary by design, whereas in-garrison Wings are much more fixed and enduring in structure.

In addition to these disparities, there is also a significant difference in the organic C2 capability of these two types of Wings. A typical in-garrison Wing is authorized a single Command Post (CP) which performs such activities as monitoring and controlling assigned forces, operating communications systems, and area defense. Additionally, in-garrison Wings have a Plans (XP) team that develops, coordinates, and publishes wing plans.⁷² Wing XP is also responsible for standing up an Emergency Operation Center (EOC) in the event contingency response is required to unexpected events such as natural disaster or enemy attack.⁷³ Therefore, suffice it to say the organic C2 capability of an in-garrison Wing is extremely limited and internally focused. The AEW, however, has a slightly more robust capability in the Wing Operations Center (WOC). The WOC includes not only a CP, but also key C2 elements such as a battle staff and planning personnel; it is designed to integrate vertically with the AOC and horizontally with other elements of the TACS.⁷⁴ The capability and role of the WOC in the greater Air C2 system is a key point that will be revisited in later in this chapter and in Chapter 5.

⁷² DAF, AFI 38-101, 87.

⁷³ Department of the Air Force (DAF), Air Force Manual (AFMAN) 10-207, *Command Posts* (Washington, DC: DAF, 2018), 83.

⁷⁴ Air Land Sea Application Center (ALSA), Air Force Tactics, Techniques, and Procedures (AFTTP) 3-2.17, *TAGS: Multi-Service Tactics, Techniques, and Procedures*

A final point of distinction regarding the characterization of a Wing, specifically, an Operational Wing, is that of the type of assets assigned to the Wing. For instance, if the majority of aircraft assigned to a Wing are bomber aircraft, the Wing is likely to be dubbed a “Bomber Wing.” As a result, there are a variety of such qualifiers across Air Force Wings. For example, there are Fighter, Bomber, Special Operations, Air Control, Air Mobility, Air Refueling, Airlift, and Missile Wings, to name a few. Additionally, if a Wing possesses multiple aircraft to service a variety of mission sets, it may be called simply a “Wing” with no qualifier other than the unit’s numerical designation. This is the case for the 18th Wing at Kadena Air Base in Okinawa, Japan, which has permanently assigned fighter, air control, air refueling, and rescue aircraft.

Returning to the question at hand, the term “Wing” as a subject of research for this thesis can now be further clarified. The type of Wing being considered is an Operational Wing, as opposed to an Air Base Wing or Specialized Mission Wing. Given this analysis is in the context of peer conflict, the Wing may be an in-garrison Wing if it is proximate to the area of conflict, which would likely be the case for Wings in the USAFE or Pacific Air Forces (PACAF) AORs. It may also be an AEW if such a provisional unit is formed in response to peer conflict, or if an existing AEW is utilized. Finally, the type of Wing being analyzed might be organized around a variety of different aircraft and mission sets depending on the capabilities required. Therefore, it is not necessary to utilize qualifiers such as “Fighter Wing” for this thesis.

for the Theater Air-Ground System (TAGS) (Joint Base Langley-Eustis, VA: ALSA, 2020), 28.

While it is now clear there is a multitude of ways to classify a Wing, the organization internal to an Operational Wing is generally the same. Each Wing is comprised of a Wing Staff and multiple subordinate Groups; the Groups are organized around a primary mission Group and the necessary supporting Groups. For Operational Wings, the primary mission Group is the Operations Group, and the standard supporting groups are the Maintenance Group, Mission Support Group, and Medical Group,⁷⁵ as depicted in Figure 3. Therefore, answering SRQ 2, the Wing's organization is driven functionally by its mission; it is assigned aircraft to accomplish the mission, built around a primary Operations Group in pursuit of that mission, and provided various other Groups in support. A more subtle but equally important aspect of the Wing's organization is that it represents, by design, the lowest echelon of command with the requisite structure and resources to self-sustain air operations. As such, the Wing is the ideal unit poised to grow Air C2 capability in the face of peer conflict—so that it may remain an effective fighting force capable of maintaining the initiative, even if isolated from the AOC.

⁷⁵ DAF, AFI 38-101, 74.

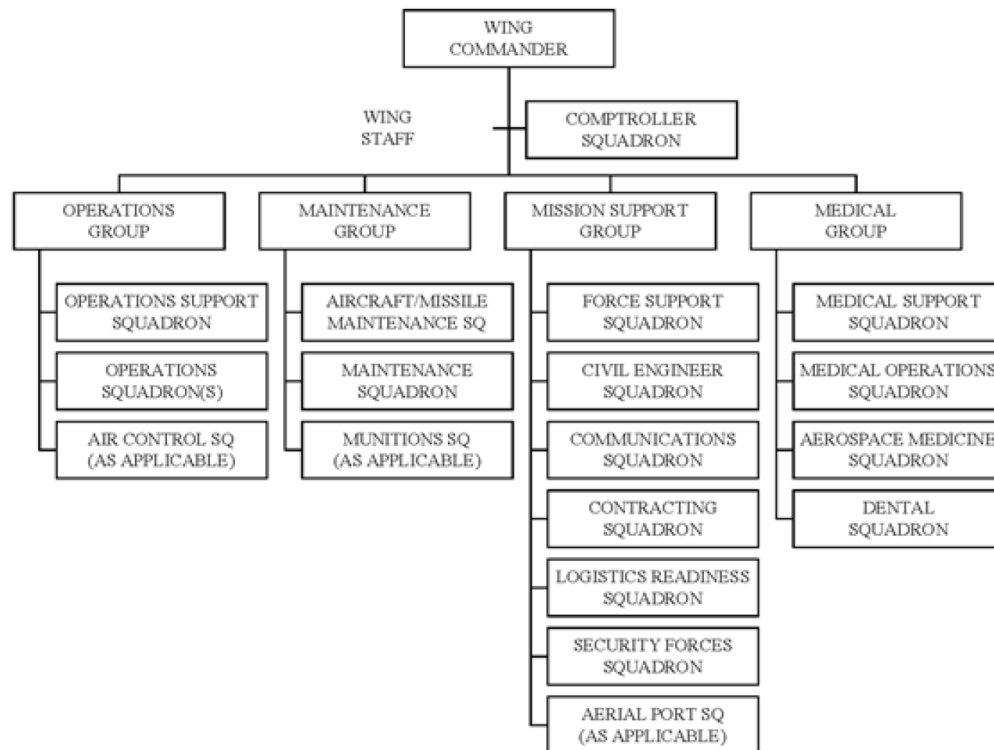


Figure 3. Wing Organization

Source: Department of the Air Force (DAF), Air Force Instruction 38-101, *Manpower and Organization* (Washington, DC: DAF, 2019), 85.

The Relationship between the AOC and the Wing

Analysis of the AOC and the Wing to this point lays the foundation to answer SRQ 3: “How do the organizational structures of the AOC and the Wing interact to produce air effects in combat?” The first item to clarify is that the Wing essentially has two different chains-of-command depending on the circumstances of its activities. One chain-of-command is utilized for routine organize, train, and equip activities during peacetime, for which the Wing reports through the NAF to the MAJCOM. This can be called the administrative chain-of-command. The second chain-of-command is specific to military operations and joint training, during which the Wing reports to the ACC through

both the AFFOR staff and the AOC.⁷⁶ This analysis focuses on the latter of the two, which can be referred to as the operational chain-of-command.

After an in-depth study of AOC's interaction with the Wing, it is the author's assertion that all activities which comprise Air C2 fit into one of two categories; 1) enabling activities, meaning those performed when the aircraft are on the ground, or 2) execution activities, meaning those that are performed once aircraft are in the air. When the Wing's aircraft are on the ground, most Air C2 enabling activities revolve around planning and preparation, which primarily involves the activities of the AOC's Strategy Division (SD) and Combat Plans Division (CPD), with inputs from Intelligence, Surveillance, and Reconnaissance Division (ISR/D) and Air Mobility Division (AMD). The SD, for example, is responsible for long-term planning, developing the ACC's guidance, and operational assessment. The SD communicates these activities to the Wing primarily through publishing documents such as the Joint Air Operations Plan (JAOP) and the Air Operations Directive (AOD).⁷⁷ The CPD is responsible for near-term planning and assists the ACC with OPCON of assigned forces by assigning objectives and tasking missions. These activities are communicated to the Wing through documents such as the Master Air Attack Plan (MAAP), Special Instructions (SPINS), and the Air Tasking Order (ATO).⁷⁸ The ISR/D communicates with the SD, CPD, and the Wing throughout all phases of planning and preparation to provide information on the

⁷⁶ CJCS, JP 1, II-9.

⁷⁷ DAF, DAFMAN 13-1, 22-23.

⁷⁸ Ibid., 27.

operational environment, battlespace awareness, and target development.⁷⁹ Similarly, the AMD works with the SD, CPD, and the Wing to provide air mobility missions in support of operations.⁸⁰ It is also important to note that Wings will typically embed at least one Liaison Officer (LNO) from their unit into the AOC. The LNO communicates developments from the AOC back to the Wing's planning function, which depending on the unit, may be Wing XP, a Mission Planning Cell (MPC), or some combination of both. This relationship allows the Wing to be involved with the AOC in the iterative process as plans are developed.

Once a plan is complete and air forces are tasked, aircraft get airborne and Air C2 execution activities begin. The ACC primarily executes C2 of airborne forces through the Combat Operations Division (COD), which, in turn, leverages subordinate elements of the TACS via various communications networks. The TACS can be further broken down into ground and airborne elements. Typical ground elements include radar stations such as a Control and Reporting Center (CRC) and ground force integration elements like an Air Support Operations Center (ASOC) or Tactical Air Control Party (TACP). Typical airborne elements include tactical C2 platforms such as the Airborne Warning and Control System (AWACS) or the Joint Surveillance Target Attack Radar System (JSTARS) and airborne extensions of air support control such as a Forward Air Controller (Airborne) (FAC(A)) or a Tactical Coordinator (Airborne) (TAC(A)).⁸¹ This

⁷⁹ DAF, DAFMAN 13-1, 45.

⁸⁰ Ibid., 53.

⁸¹ ALSA, TAGS, 23-28.

relationship is depicted visually in Figure 4. In addition to subordinate elements of the TACS which are primarily external to the AOC, the COD is also supported internally by inputs from ISRD and AMD.

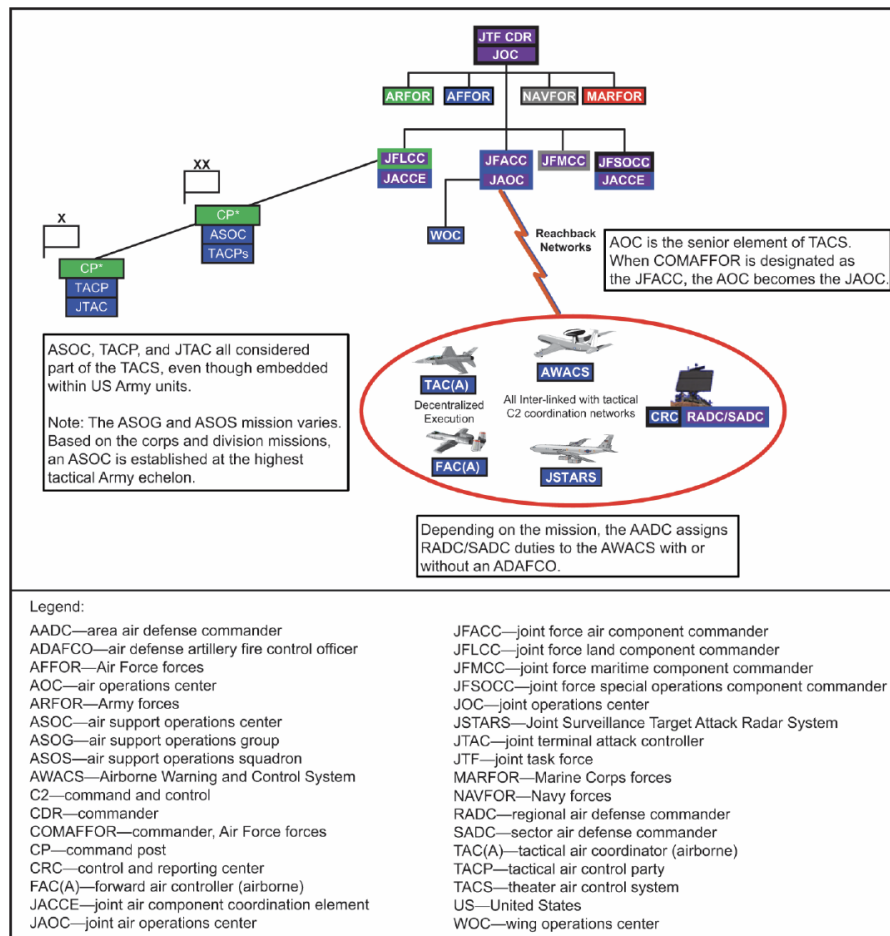


Figure 4. Theater Air Control System (TACS)

Source: Air Land Sea Application Center (ALSA), Air Force Tactics, Techniques, and Procedures 3-2.17, *TAGS: Multi-Service Tactics, Techniques, and Procedures for the Theater Air-Ground System* (Joint Base Langley-Eustis, VA: ALSA, 2020), 23.

In summary, the AOC and the Wing interact in two distinctly different ways to produce air effects during Joint Air Operations (JAO). While aircraft are on the ground,

they interact through various enabling activities to plan and prepare for operations. This interaction is facilitated both by the AOC's dissemination of several products and by the organizational communication between the AOC and the Wing. Once aircraft are airborne, the AOC and the Wing interact via a set of execution activities that are primarily facilitated by the COD utilizing TACS. Although the processes for these two sets of activities are distinct, it should also be mentioned that enabling and execution activities can happen simultaneously during the conduct of operations. For example, the ACC is likely to have command over multiple wings within a specified AOR. At any given moment, the ACC may be conducting Air C2 through execution activities with one Wing while at the same time conducting enabling activities with several others. Additionally, a single Wing may have a portion of its personnel and aircraft in the air engaged in execution activities while a separate portion are working enabling activities for aircraft and aircrew still on the ground. This emphasizes the point that there is not a clean temporal line between enabling and execution activities; however, the distinction between the two is still apparent and provides a useful context to understand the Air C2 interactions between the AOC and the Wing.

The Threat

The final bit of analysis required to understand how Air C2 might function in peer conflict is to comprehend the threat. This section answers SRQ 4: "What defines a peer adversary in terms of threat capabilities it possesses that can contest Air C2?" Given the term "peer" used in this context can be unclear and confusing, a 2001 RAND study explains "A peer competitor . . . is a state or collection of challengers with the power and motivation to confront the United States on a global scale in a sustained way and to a

sufficient level where the ultimate outcome of a conflict is in doubt even if the United States marshals its resources in an effective and timely manner.”⁸²

For this thesis, there are three key elements of this definition to highlight. First is that of the “global scale” of the conflict should it occur against a peer adversary. This implies that all components of the Air C2 system might be held at risk, be it the AOC, the Wing, elements of the TACS, etc. Furthermore, no place of true sanctuary, aside from perhaps CONUS, is likely to exist for air forces as it has in the past. The second key element of the definition is the “sustained” nature of the confrontation that would likely exist during peer conflict. While non-peer adversaries may be able to temporarily contest Air C2, a peer adversary possesses the capability to do so persistently. Last, that “the ultimate outcome of a conflict is in doubt” is a significant statement in itself. Conflict with a peer adversary means that the Air Force is unlikely to achieve outright dominance in any of the realms it has been accustomed to in the past several decades.

To further characterize the threat posed by a peer adversary, it is necessary to discuss a few key capabilities that such an opponent is likely to possess. A simple way to categorize capabilities that may pose a threat to AOC and the Wing is to do so in terms of kinetic versus non-kinetic. Perhaps the most pressing concern from a kinetic attack perspective is that posed by long-range, precision missiles.⁸³ Such missiles can be fired from the surface, either as ballistic or cruise missiles, or from a multitude of different

⁸² Thomas S. Szayna, Daniel L. Byman, Steven C. Bankes, Derek Eaton, Seth G. Jones, Robert E. Mullins, Ian O. Lesser, and William Rosenau, *The Emergence of Peer Competitors: A Framework for Analysis* (Santa Monica, CA: RAND Corporation, 2001), 7-8.

⁸³ Priebe et al., *Distributed Operations*, 9.

aircraft. Moreover, the recent development of hypersonic technology coupled with long-range precision missiles renders many legacy defense systems obsolete.⁸⁴ A weapon like this provides a peer adversary the capability to kinetically strike an AOC or Wing.

Another key kinetic capability to consider is that of anti-satellite (ASAT) weapons. While these weapons do not kinetically affect the AOC or the Wing directly, their ability to shoot down different types of satellites can significantly degrade Air C2 capabilities. Key examples include satellite communications (SATCOM), ISR, and global positioning system (GPS) satellites. Given how heavily modern JAO depend on space assets such as these, ASAT attacks have the potential to severely inhibit the ability of air forces to produce the desired air effects.

There is also a wide range of non-kinetic capabilities that peer adversaries may use to attack the Air C2 system, not the least of which lies in the cyber domain. A cyber-attack, for example, may be targeted at the AOC to disrupt or deny the vast computer networks that are required for the AOC to do its job. A cyber-attack may also target a Wing by disrupting maintenance systems required to keep aircraft flying, or by sabotaging weapons system software. Another non-kinetic capability that is problematic for Air C2 is that of electronic warfare (EW); specifically, jamming and spoofing. Utilizing an EW attack, a peer adversary could degrade or deny secure communications such as datalinks, SATCOM, and line-of-sight radio, to name a few. They could also distort communications or deliver false communications to confuse the C2 system.

⁸⁴ S. J., "What Are Hypersonic Weapons?," *The Economist*, January 3, 2019, <https://www.economist.com/the-economist-explains/2019/01/03/what-are-hypersonic-weapons>.

This list of kinetic and non-kinetic capabilities is by no means exhaustive, but it is sufficient to understand how peer threat capabilities might deny Air C2 in a variety of ways. It also paints a very clear picture of what a contested conflict in the future might look like, and how it is a starkly different picture than any conflict the Air Force has faced since World War II. Therefore, to answer the final SRQ, it can be said that a peer adversary is one that possesses the capability to degrade or deny the mechanisms necessary for the Air C2 system and its components to function, both kinetically and non-kinetically, from multiple domains. To determine how the AOC and the Wing should organize to enable Air C2 to persist in the face of such a threat, essential functions of the system must be identified.

Air C2 Functional Analysis

The task of this section is to distill the many activities which comprise Air C2 down into a comprehensive list of Air C2 Functions around which a system can be characterized. The goal in doing so is to arrive at a deeper understanding of what it means to command and control airpower, which is required to answer the primary research question of this thesis. However, this is no easy task as “function” is a multifaceted term with many different definitions—one which is used as both a verb and a noun. It is, therefore, unsurprising that no clear or consistent picture exists regarding what an Air C2 function is, even though there are dozens of terms and statements throughout doctrine, regulation, and airpower literature which all claim to be “functions,” either of Air C2 or airpower in general. Thus, to begin a functional analysis of Air C2, a clear definition must first be established.

Of the many definitions of function, two are most applicable to the discussion of Air C2 and correlate to the term's usage in the majority of related documents. The first is, "the action for which a person or thing is specially fitted or used or for which a thing exists; purpose," and the second, "any of a group of related actions contributing to a larger action."⁸⁵ Here there is a subtle, yet distinct, difference in the term's meaning which helps explain its inconsistent usage in Air C2 writings. The first definition speaks to a thing's purpose; or what it does. When viewing Air C2 through this lens, countless terms come to mind, from broad to specific, large-scale to small-scale, operational to tactical. Examples are assemble, task, assign, issue, communicate, synchronize, integrate, manage, develop, collect, analyze, and the list goes on. This definition and the language that follows quickly becomes unwieldy, to say the least, and makes it nearly impossible to bound the conversation regarding what an Air C2 function truly is. Consequently, this thesis builds on the second definition, which, instead of focusing on what something does, is focused on how something works. For analysis in this Chapter, a function is defined as a group of related activities that contribute to a larger action. Once the conversation is framed in these terms, the concept of what constitutes an Air C2 function becomes more clear.

In review of related C2 doctrine, regulation, and literature, seven terms appear repeatedly and meet the definition of a function as described above. They are monitor, assess, plan, execute, direct, coordinate, and control. Within each of these functions is a group of related activities that contribute to the function's performance. Further, it is

⁸⁵ Merriam-Webster, "Function," accessed February 18, 2021, <https://www.merriam-webster.com/dictionary/function>.

these seven functions together that enable the commander to effectively command and control forces. This relationship reveals another nuance about the chosen definition of function. That is, a group of functions working together inherently create a new function which they are a part of. For example, joint doctrine outlines several functions of joint operations, called joint functions, one of which is C2.⁸⁶ Therefore, it follows, the seven functions identified in this thesis that constitute C2 create a function in itself—one which is a part of a larger system.

A closer look at the seven identified C2 functions reveals that they are often used together in different groupings. The first grouping is planning, directing, coordinating, and controlling, a grouping that is consistent between joint doctrine and Air Force regulation regarding C2.⁸⁷ This first grouping of functions is thereby common language between the Air Force and the rest of the joint force. The second grouping is monitor, assess, plan, and execute. As opposed to the first grouping, this set of functions only appears together in Air Force publications. In fact, AFI 13-103 describes this grouping as a process called the ACC's decision cycle.⁸⁸ The use of this terminology is likely due, at least in part, to the influence of renowned airpower theorist and retired Air Force Colonel, John Boyd. Boyd developed a famous concept known as the OODA Loop

⁸⁶ CJCS, JP 1, I-18.

⁸⁷ From CJCS, JP 1, "C2 functions are performed . . . by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission," echoed in AFI 13-103, "The air component C2 processes are . . . employed by the air component commander through planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission."

⁸⁸ DAF, AFI 13-103, 43.

(Observe, Orient, Decide, Act), which proved to be a useful model for many things, not the least of which was a way to describe decision cycles. The OODA Loop can be used to think about how two opponents make decisions during conflict, and the opponent who can execute his OODA loop faster than the other—to get inside the adversary’s OODA loop—will be the one who wins. In this way, Boyd’s concept was a popular way of describing the Air Force’s success during Desert Storm,⁸⁹ and has since been inculcated in the culture of the Air Force. Therefore, it should not be surprising when Boyd’s OODA Loop is compared to the ACC’s Decision Cycle listed in AFI 13-103, the influence is clear: monitor (observe), assess (orient), plan (decide), execute (act). Consequently, airmen see the functions that comprise the ACC’s decision cycle as an essential element of effective Air C2.

While the two identified groupings of Air C2 functions provide some insight, this analysis needs to be taken a step further to arrive at a more meaningful observation. For instance, the function “plan” appears in both groupings. For redundancy’s sake, if “plan” is removed from the first grouping, two entirely separate categories emerge; 1) direct, coordinate, control, and 2) monitor, assess, plan, execute. Now compare these categories of functions to the previous discussion in this chapter which describes the enabling and execution activities of Air C2. If a function is a group of similar activities, and if Air C2 activities can be categorized as either enabling or execution activities, then it follows that an Air C2 function would be either an enabling function or execution function, depending on the activities it is comprised of. As such, this thesis submits that monitor, assess, and

⁸⁹ John A Boyd, *A Discourse on Winning and Losing*, ed. Dr. Grant T. Hammond (Maxwell Air Force Base, AL: Air University Press, 2018), 385.

plan can be called “enabling functions” while direct, coordinate, and control can be called “execution functions.” Finally, the term “execute” must be addressed as it describes both a function itself and a group of separate functions. This is not entirely unexpected given the definition of a function as a group of activities for a common purpose, and the acknowledgment that a coordinated group of functions constitutes, by definition, a greater function within the system. However, to standardize the language for analysis, the following approach is taken; direct, coordinate, and control will remain labeled as three of the seven Air C2 functions but can be thought of as sub-functions to that of execution.

This line of logic that identifies a set of “enabling functions” and “execution functions” begins to arrive at a useful framework for functional analysis of Air C2 as a system. However, to add appropriate depth, specific “essential activities” which comprise the function need to be determined. To do so, the author has synthesized a broad list of activities from document analysis of doctrine and regulation, some of which are referred to as tasks, capabilities, or responsibilities of Air C2. Those activities which were redundant with other activities were consolidated. Additionally, activities strategic in nature or that require national-level coordination were removed from consideration, as those types of activities are unlikely to be performed below the ACC level, and, therefore, do not apply to the Wing.⁹⁰ The resulting list of essential activities is depicted

⁹⁰ Examples include the development of ACC guidance, coordination for space assets, execution of cyber activities, and nuclear weapon considerations.

in Figure 5. While not exhaustive, the list represents the minimum activities that are required to perform C2 of airpower and the functions they contribute to.⁹¹

Monitor
Develop an operational picture
Observe friendly operations and unit strength
Observe enemy operations and reactions
Track communications and logistics status
Collection and Processing, Exploitation, Dissemination (PED) of intelligence
Conduct surveillance & reconnaissance
Identify and develop targets
Assess
Conduct broad operational assessment
Conduct day-to-day operations assessment
Develop Measures of Performance (MOPs) and Measures of Effectiveness (MOEs)
Judge the motives and characteristics of enemy forces
Analyze effectiveness of intelligence activity
Assess effects on targets
Plan
Provide guidance to forces
Conduct strategic planning
Conduct near-term planning (<48 hours)
Conduct long-range planning (>48 hours)
Develop planning documents
Design air operations
Determine refueling requirements
Determine other mobility requirements
Allocate effects to targets
Assign missions and task aircraft
Execute
Direct
Prioritize and allocate resources
Assess and mitigate risk
Resupply air operations
Coordinate
Synchronize and deconflict
Communicate with aircraft
Guide aircraft to deliver effects on targets
Control
Produce an air picture
Manage airspace
Make adjustments to plans

Figure 5. Air C2 Essential Activities

Source: Created by author.

⁹¹ Some activities may contribute to more than one function; however, they are listed only once under the function they are most closely related to.

The description of Air C2 functions to this point begs the question, what does it mean to C2 airpower? In other words, from an Air Force perspective, how is Air C2 different than any other kind of C2? The airpower portion of this question is outlined in Department of Defense Directive (DODD) 5100.01,⁹² which lists eight functions of the Air Force; nuclear operations, air superiority, precision attack, ISR (intelligence, surveillance, reconnaissance), rapid mobility, agile combat support, personnel recovery (PR), and C2.⁹³ Using the same approach applied to the Air C2 functions, the list of Air Force functions should be reduced to remove any not likely to be applicable below the ACC level. Agile combat support, for example, requires theater-wide coordination and thus is likely to require capabilities only available to the ACC. Nuclear operations meet this criterion, as well, and C2 can also be removed as it is redundant with the previous portion of Air C2 analysis. This leaves five remaining functions; air superiority, precision attack, ISR, PR, and rapid mobility. These are hereby referred to as the “airpower functions.”⁹⁴

⁹² Secretary of Defense (SecDef), Department of Defense Directive (DoDD) 5100.01, *Functions of the Department of Defense and Its Major Components* (Washington, DC: DoD, 2020), 38-40.

⁹³ The Air Force is not the only service that brings airpower to joint operations, and characterizing airpower by the eight functions listed above may unintentionally omit some of the specialized capabilities which sister services bring to the fight. However, even amongst the other services, the majority of airpower activities can be categorized within these eight functions.

⁹⁴ Some functions have subordinate activities described in DODD 5100.01. Air superiority is comprised of offensive counterair (OCA) and defensive counterair (DCA). Precision attack is comprised of close air support (CAS), air interdiction (AI), and strategic attack. Rapid mobility is comprised of air mobility and aeromedical evacuation (AE).

Using the concepts of Air C2 functions and airpower functions that have been developed, a framework emerges that visually demonstrates what it means to C2 airpower. Figure 6 depicts a cross-functional matrix in which the x-axis lists the airpower functions while the y-axis lists the Air C2 functions. This matrix, used in conjunction with the list of Air C2 activities in Figure 5, was developed to provide insight into a unit's ability to C2 air operations by interviewing subject-matter experts (SMEs). No interview data was needed on the AOC to this end since the C2 of air operations is the primary purpose for the AOC's existence. As revealed in the AOC analysis portion of this chapter, the ability to perform Air C2 functions is inherent in the AOC's structure. Furthermore, its successful performance of C2 has been well documented. Instead, this matrix was used to assess the C2 capability of the next echelon of operational command below the AOC; that is, the Wing.

Air Command & Control (C2) Matrix

		*Airpower Functions							
		Air Superiority		**Precision Attack		Intelligence, Surveillance, and Reconnaissance (ISR)	Personnel Recovery (PR)	Rapid Mobility	
		Offensive Counterair (OCA)	Defensive Counterair (DCA)	Close Air Support (CAS)	Air Interdiction (AI)			Air Mobility	Aeromedical Evacuation (AE)
Air C2 Functions	Monitor								
	Assess								
	Plan								
	Execute								
GREEN		Fully Capable	Can perform all associated activities listed on the C2 FAW						
YELLOW		Partially Capable	Can perform some of the associated activities listed on the C2 FAW						
RED		Not Capable	Cannot perform any of the associated activities listed on the C2 FAW						

Caveats:

*Combat Support and Nuclear Operations not included

**Strategic Attack not included

Figure 6. Air C2 Cross-Functional Matrix

Source: Created by author.

Wing SMEs were asked to fill in the matrix with their best assessment of the Wing's ability to perform each Air C2 function across each airpower function, utilizing the green/yellow/red legend in Figure 6 and the list of essential Air C2 Activities outlined in Figure 5. For example, if a Wing could perform a few, but not all, of planning activities for CAS, the square at the intersection of "Plan" and "CAS" would be marked yellow for "partially capable." Once filled out, the matrix provides a visual representation of a Wing's ability to C2 the full spectrum of air operations. The author then interviewed the Wing SMEs to better understand the context behind the assessments provided.⁹⁵

Fusing the data collected from the Wings into a singular picture of Wing C2 capability presents some difficulty. Each individual Wing's capability is closely tied to the assets assigned; therefore, if a Wing lacks the aircraft to perform a certain airpower function, its ability to C2 that function is "not capable" across the board. A Wing with only air superiority fighters, for instance, is not capable of carrying out precision attack. A Wing with no airlift assets cannot conduct rapid mobility. The result is an inconsistent picture of Wing C2 capabilities. However, by combining the most optimistic assessments from each Wing, a best-case scenario for Wing C2 can be depicted. Figure 7 represents the combined Wing C2 capability of a theoretical Wing that possesses all the assets necessary to perform the full spectrum of airpower functions.⁹⁶

⁹⁵ Data was collected from Wings in the Pacific and European areas of responsibility, as well as Wings based in the continental United States.

⁹⁶ The Air Force is currently experimenting with a method labeled the "Lead Wing" concept to combine the capabilities of multiple in-garrison Wings; this is discussed further in Chapter 5.

Air Command & Control (C2) Matrix

		*Airpower Functions							
		Air Superiority		**Precision Attack		Intelligence, Surveillance, and Reconnaissance (ISR)	Personnel Recovery (PR)	Rapid Mobility	
		Offensive Counterair (OCA)	Defensive Counterair (DCA)	Close Air Support (CAS)	Air Interdiction (AI)			Air Mobility	Aeromedical Evacuation (AE)
Air C2 Functions	Monitor								
	Assess								
	Plan								
	Execute								

GREEN	Fully Capable	Can perform all associated activities listed on the C2 FAW
YELLOW	Partially Capable	Can perform some of the associated activities listed on the C2 FAW
RED	Not Capable	Cannot perform any of the associated activities listed on the C2 FAW

Caveats:

*Combat Support and Nuclear Operations not included

**Strategic Attack not included

Figure 7. Combined Wing C2 Capability

Source: Created by author.

The data revealed that existing Wings possess very little capability to perform the monitor and assess Air C2 functions; however, they have at least a limited capability to perform the planning and execution functions. To demonstrate why this is the case, each of these will briefly be discussed in turn. First, within the monitor function, Wings lack access to, or the ability to develop, a common operating picture (COP). While certain Wings with assigned tactical C2 (Tac C2) assets⁹⁷ can produce an air picture, most cannot monitor other aspects of joint operations, such as the location and disposition of land or sea forces. Another Wing deficiency lies in the lack of training and resources for intelligence personnel to perform activities such as the processing, exploitation, and

⁹⁷ Examples include airborne or ground-based radars. These have the capability to provide information on friendly, neutral, and enemy aircraft.

dissemination (PED) of intelligence and target development—these capabilities are mostly held at the AOC level. Despite these limitations, Wings do have marginal capability to perform some “monitor” activities, such as performing non-traditional ISR via targeting pods and the ability to manage their own logistics and communications.

The assess function is where Wings are the weakest. Wings have some capability to conduct assessment of day-to-day operations via means such as airborne battle damage assessments and aircrew debriefs, but most other assessment activities are lacking. Perhaps most concerning is the Wing’s inability to assess the enemy’s forces or motives; it is almost entirely dependent on the AOC for this information. Additionally, Wings typically do not develop or train to measures of performance (MOPs) or measures of effectiveness (MOEs),⁹⁸ meaning they are not likely to know how their air operations are affecting the enemy beyond the outcome of daily missions. As previously noted, the assess function of Air C2 is an essential element of the commander’s decision cycle. Without the assessment piece, a commander’s ability to C2 air forces effectively is severely degraded.

Compared to the monitor and assess functions, Wings have a much greater capability to perform the planning and execution functions.⁹⁹ When considering planning, this is in large part due to the fact that all Operational Wings require at least some version of a mission planning cell (MPC) to perform their tactical mission. Within

⁹⁸ For more information on MOPs and MOEs, reference CJCS, JP 3-30, ch. III, III-10 – III-11.

⁹⁹ However, the previously mentioned limitations with targeting and intelligence have a negative impact on the Wing’s ability to carry out the precision attack and offensive counterair missions.

this function, the Wing's primary constraints are time and scope. In the case of the former, Wings are typically focused on short-term planning. This capability could carry a Wing through brief periods of isolation from the AOC; however, periods of isolation beyond one to two days would begin to exceed the Wing's planning capability. In the case of scope, a Wing's ability to plan is limited by personnel—oftentimes the planners are the same individuals who fly the missions. Additionally, an increase in planning responsibilities often times draws in personnel from other units within the Wing. As a final point on planning, even when assigned capable aircraft, Wings are only partially capable of planning the personnel recovery and rapid mobility functions. This is due to the fact that the planning functions for these activities usually tie into a larger theater-wide network.

Finally, Wings possess varying degrees of ability to perform the execution function of Air C2. Given that the majority of these activities are carried out by the Tactical Air Control System (TACS), it is not surprising that a Wing's ability to do this directly correlates to the Tac C2 assets it has assigned. For example, a Wing that possesses organic AWACS and CRC units is going to have a fairly robust ability to direct, coordinate, and control, whereas a Wing without these units will have little to no capability. Interviews revealed that Wings are experimenting with tools like Link-16 datalink and tracking pods to perform some of the execution activities; however, these work arounds are mostly limited to providing data on the activities of friendly air forces. Wings are heavily reliant on the TACS for the execution function.

These insights into a Wing's Air C2 capabilities are consistent with previous analysis in this chapter. That is to say, current Air Force doctrine and regulation

emphasize the Wing's role as a force provider, and very little weight is given to its role as a node in the C2 system. In fact, many Wings are not even organized, trained, or equipped to produce a Wing Operations Center (WOC), the ideal entity to drive the functions which would enable Air C2 at the Wing level. Of those Wings interviewed, several recognize this gap and are in the process of building and training to a WOC capability; however, many noted challenges that arise due to limited personnel and equipment. Considering the broader functional analysis in this section, it can now be said that the Wing is not currently organized to C2 airpower. However, it does possess a certain ad hoc Air C2 capability, limited in duration and scope, and characterized by the units which are organic to that Wing. The task now turns to determining how this realization affects the Air C2 system as a whole.

Air C2 System Analysis

The final step of analysis for this thesis utilizes the functions identified and characterizes them in terms of a broader Air C2 System. The ultimate purpose of this system is to deliver air effects during peer conflict to achieve joint campaign objectives and mission accomplishment. Figure 8 depicts the system as it currently exists. The system is bifurcated into two hemispheres. The left hemisphere depicts those parts of the system which correlate to the enabling functions of the system, that is, monitor, assess, and plan. Here, it is demonstrated how the processes of the five AOC divisions directly feed the ACC's decision cycle, and when that decision cycle lands on "execute," the system switches from the left to the right hemisphere.

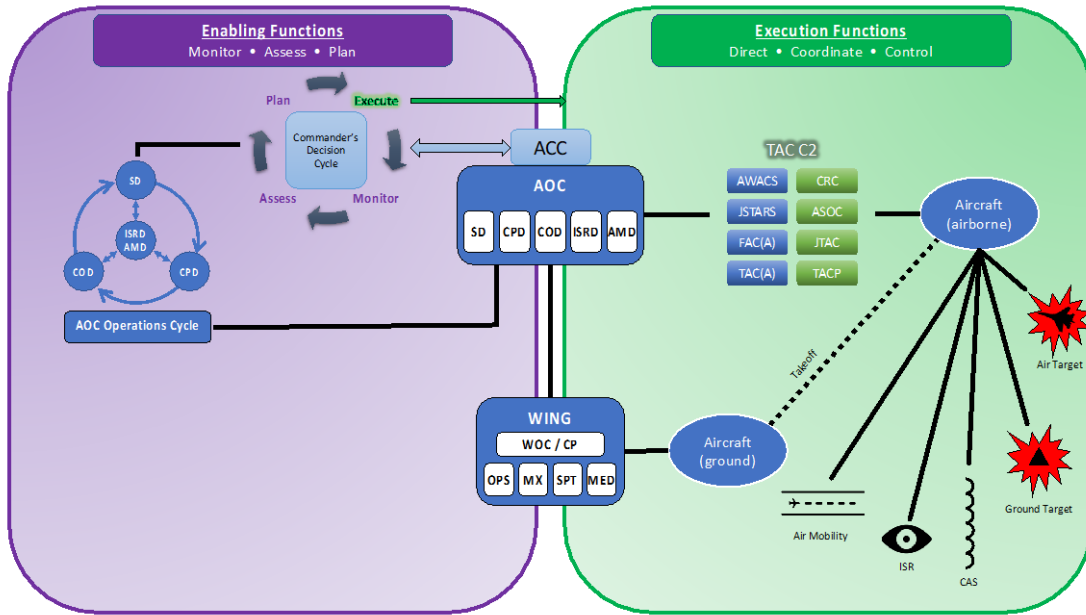


Figure 8. The Current Air C2 System

Source: Created by author.

The right hemisphere depicts those parts of the system which correlate to the execution functions of direct, coordinate, and control. The ACC primarily performs these functions through the AOC's Combat Operations Division (COD) and the Tactical Air Control System (TACS), the latter of which translates operational Air C2 into tactical Air C2 and ultimately enables air effects to be delivered. Delivery of the desired effects, as depicted by the links on the right side of the execution hemisphere, is the intended product or output of the system. Air and land targets are hit and missions such as CAS, ISR, and Air Mobility are conducted.

In Figure 8, it should also be noted that none of the Air C2 planning or execution functions are linked to the Wing. While there is the potential for some Air C2 capability to be produced at the Wing level, it is extremely limited and the current system is not

designed for the Wing to perform this role. In the system's current design, the Wing is entirely dependent on its link to the AOC for both enabling and execution functions of Air C2. This is the critical seam.

The term "seam" is often used when discussing military operations to describe a place where two entities come together. A seam could be a line on a map separating areas of responsibility and authority, across which two different entities must interact. A seam may also be an organizational feature, in which every division within an organization requires its own mechanisms for coordination amongst one another. In this case, seams exist between echelons of command; specifically, between the AOC and the Wing. This seam is stitched together by the links which enable the AOC and the Wing to interact. The seam is two-fold; the link of the AOC interacting with the Wing to perform enabling functions and the link between the AOC and the Wing's aircraft, once airborne, through the TACS.

Utilizing the threat analysis provided earlier in this chapter, two scenarios will be utilized to demonstrate how threat capabilities can affect the Air C2 system. The first will be referred to as the "Non-Kinetic Attack" scenario, as depicted in Figure 9.

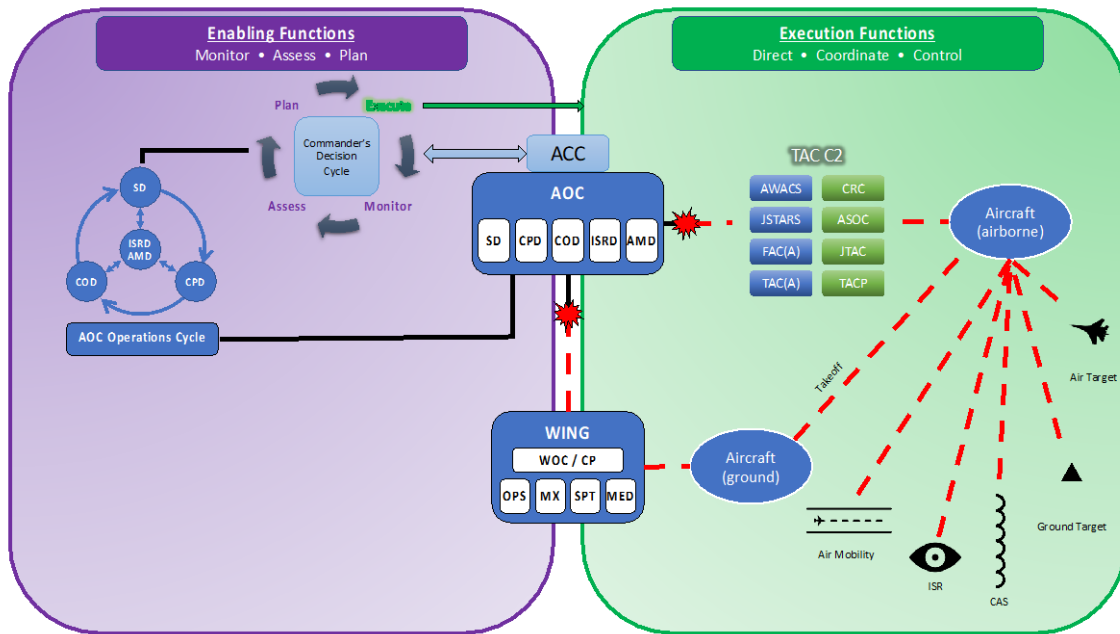


Figure 9. Non-Kinetic Attack

Source: Created by author.

This diagram represents the potential effects of a non-kinetic attack targeted at the AOC's ability to communicate externally, thereby isolating the Wing from the AOC. In this case, the link between the AOC and the Wing is denied, thereby blocking the Wing's access to the requisite enabling functions. Without the ability to perform these functions on its own, aircraft remain on the ground and no air effects are produced until the link is reestablished. Furthermore, this type of attack could degrade or deny the AOC's ability to perform Air C2 execution functions via the TACS, which likely impacts the ability of airborne aircraft to accomplish their mission. These types of attacks can be overcome and may be short in duration; however, they will likely occur at a high frequency during peer conflict and pose significant challenges to the Air C2 system as it is currently designed.

The next scenario is labeled “Kinetic Attack,” as depicted in Figure 10. Here, the AOC is physically struck by the adversary and ceases to operate until it can be reconstituted. Such a kinetic attack is likely to deny the link between the AOC and Wing for a much longer period—potentially days or weeks—during which the Wing does not have access to the AOC’s Air C2 functions. While the non-kinetic scenario might be overcome by leveraging the ad hoc Air C2 capabilities of the Wing or the Tac C2 of the TACS, the kinetic scenario causes the entire system to break down.

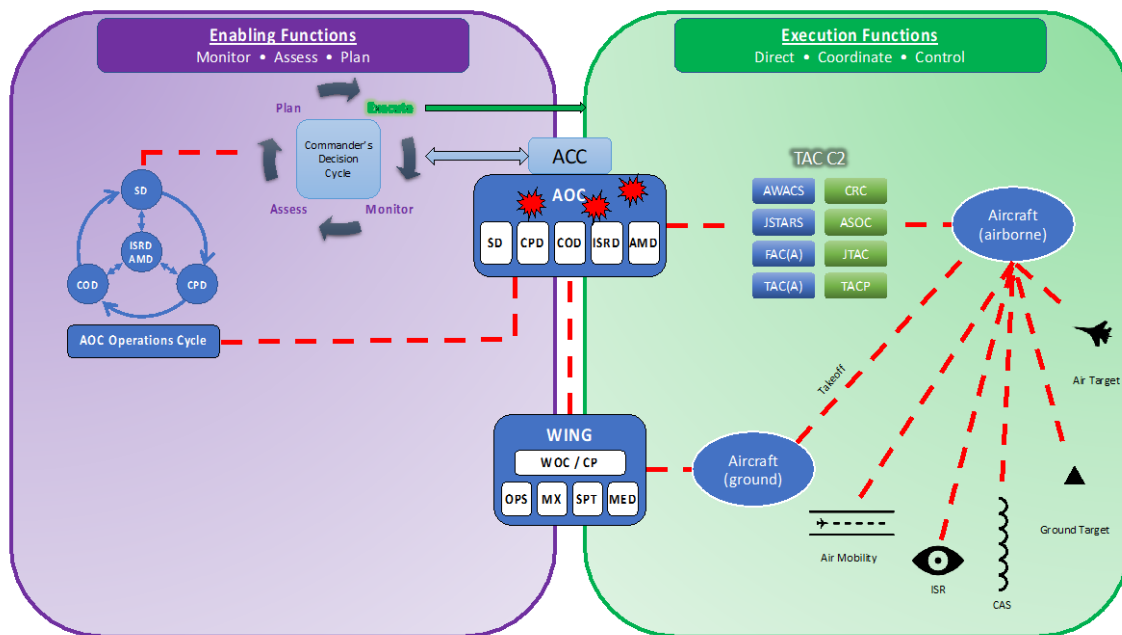


Figure 10. Kinetic Attack

Source: Created by author.

At this point, it is clear the AOC is the single point of failure in the Air C2 system, and if it is attacked, as is likely in conflict with a peer adversary, the system becomes severely degraded if not entirely paralyzed. As such, the vulnerability of these

links and their necessity to the system's functionality are what make the seam between the AOC and the Wing critical for the conduct of air operations. How can the system be organizationally redesigned to be more resilient and redundant such that, even if the AOC is isolated for extended periods, the system can continue to function? Figure 11 displays a redesigned system that depicts a possible solution. In this system, the Wing is reorganized to perform the essential activities of both the enabling and the execution functions of Air C2. Furthermore, a secondary link is established between the Wing and the TACS to be activated in the event the primary link between the AOC and the TACS is denied.

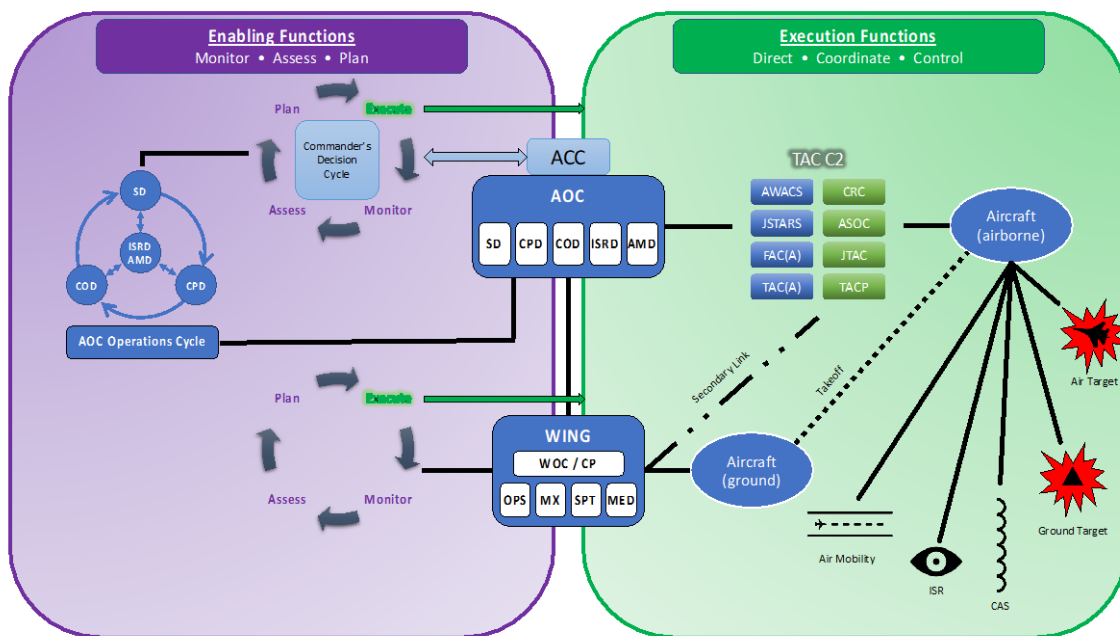


Figure 11. Redesigned Air C2 System

Source: Created by author.

Now to revisit the previous threat scenarios in the redesigned system. If the link between the AOC and the Wing is denied while aircraft are on the ground, the Wing possesses the capability to monitor, plan, and assess internally, allowing the enabling functions to persist until the link is reestablished. If the link between the AOC and the TACS is denied, a secondary link between the Wing and the TACS can be activated, providing a redundant capability for the system to perform its execution functions. In the event that AOC is kinetically attacked, the Wing's link to the TACS can become more enduring until the AOC is reconstituted. Figure 12 shows how the redesigned system could continue to function if the AOC is attacked.

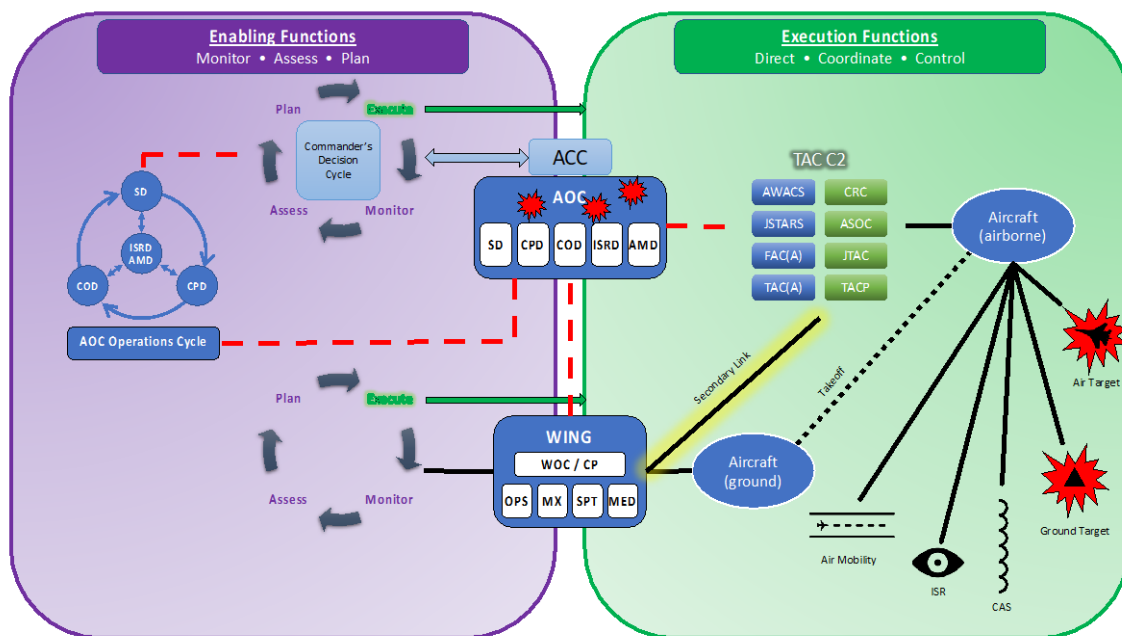


Figure 12. Redesigned Air C2 System with AOC Attacked

Source: Created by author.

Countless other threat scenarios that can be envisaged, but the examples provided here clearly demonstrate the necessity for redundancy in the Air C2 system to a degree that does not currently exist. To reorganize Air C2 in such a way is essential to ensuring the system can function in peer conflict, so the required air effects can be delivered for the joint force. Further, to create Air C2 capacity at the Wing level is not just to produce a more redundant and survivable system, it is to create a newly empowered echelon of subordinate command. This is a vital element of mission command and how the Air Force should think of its Wings if its primary warfighting unit is to maintain the initiative throughout the fog and friction of peer conflict.

Findings

As the culmination of literature review, research, and analysis, this thesis submits three key findings.

Finding #1: The Air Force has centralized nearly all Air C2 capability at the AOC creating a single point of failure within the system

As demonstrated in the literature review, the Air Force's journey to find the right approach to Air C2 led to the development of Centralized Control and Decentralized Execution (CC/DE) as a tenet of airpower. This tenet was originally meant to be flexible in application, yet as the United States continued to grow as a world power, it was consistently able to apply airpower from a relatively uncontested position of advantage. This reality, combined with awesome capabilities provided by modern technology, set the conditions for CC/DE to devolve from a flexible tenet into something more akin to dogma. The overwhelming success of air operations during Desert Storm further

cemented this trajectory and has led, in part, to the highly centralized Air C2 system that exists today.

Functional analysis of the AOC further exposes this fact. It has been shown that Air C2 functions are comprised of various essential activities which can be considered either enabling or execution in nature and that nearly all of these activities and functions are performed at or through the AOC. Furthermore, this thesis highlights the fact that peer adversaries possess several capabilities which hold the AOC at risk by way of degrading or denying the AOC's activities and its links to the Wing. This may be accomplished through a variety of kinetic or non-kinetic attacks and, in the best case, might be short in duration, but in the worst case, could result in the total destruction of the AOC. When placed in the broader context of Air C2, such an attack creates a paralytic effect on the system as it is currently designed.

Finding #2: The threat posed by peer conflict demands a redundant and resilient system with Air C2 capabilities at multiple echelons of command

To avoid C2 paralysis in the face of such a threat, a system must be established with C2 capabilities at more than one echelon of command. In such a system, lower echelons of command can continue operations and maintain initiative against the enemy, even when cut off from higher command direction. Systems analysis has demonstrated a way this could be accomplished within the current Air C2 system, by reorganizing the Wing so that it is capable of performing essential Air C2 functions in the event the seam between the AOC and the Wing is denied. The result is a system that can continue to function in the face of the threat posed by a peer adversary.

Developing Air C2 capabilities at multiple echelons of command is also essential to the Air Force's ability to execute a mission command approach to Air C2. While Air Force doctrine points to CC/DE as the Air Force's method to achieve mission command, it has been shown how the contemporary application of CC/DE falls short of mission command in practice. While recent development of concepts such as standing integrated tasking orders (ITOs) and conditions-based authorities (CBAs) are promising steps in the right direction, their potential will be fruitless if the Wing does not possess the appropriate tools to perform a degree of Air C2.

Finding #3: The Wing is not organized or resourced to produce the requisite C2 capability to institute a mission command style approach

Document analysis and interviews with Wing SMEs reveal that, even in the most robust in-garrison Wings today, there is minimal capability for the Wing to perform C2 of air operations. This is unsurprising as the Wing is not currently designed to do so—it is designed to be primarily a force provider as opposed to a C2 element. As a result, The Wing generally lacks the ability to perform essential C2 activities such as the processing, exploitation, and dissemination (PED) of intelligence, target development, production of or access to a common operating picture (COP), long-range planning of air operations, and assessment of air operations. While the Wing does have some capacity to perform the planning and execution functions, it is almost entirely dependent on the AOC for the monitor and assess functions. These gaps in the Wing's C2 capability are particularly problematic when considering peer conflict and the need for air forces to maintain the initiative, especially when isolated from the AOC.

The Wing Operations Center (WOC) is a promising construct that has the potential to grow Air C2 capability at the Wing level; however, its implementation and usage is inconsistent from Wing to Wing. A likely contributing factor to this inconsistency is the notable absence of the WOC in Air Force doctrine and regulation. The WOC is not mentioned in the Air Force's C2 doctrine, its manpower and organization regulation, nor its AOC regulation. In joint doctrine, the WOC is depicted on the Theater Air Control System (TACS) diagram, but no description of its role is provided. One place a description of the WOC can be found is in a joint service tactics manual; however, that publication ties the WOC's role to Air Expeditionary Wings (AEWs), thereby not addressing the role of a WOC in an in-garrison Wing.¹⁰⁰

Summary

This chapter of analysis was designed to ultimately answer the primary research question, "How should the Air Force's primary operational C2 entity, the AOC, and its primary warfighting unit, the Wing, organize within an Air C2 system to ensure delivery of air effects in a conflict with a peer adversary?" The research herein suggests the answer is for the AOC and the Wing to reorganize to generate a true mission command capability, doing so by empowering the subordinate echelon of command and enabling it to produce a degree of Air C2. However, this is no easy task. The findings in this chapter reveal the complexity and severity of the issues that the Air Force must overcome to achieve such an end state, a picture which is certainly daunting. In Chapter 5, the author

¹⁰⁰ The documents referenced here are DAF, AFDP 3-30; DAF, AFI 38-101; DAF, DAFMAN 13-1; CJCS, JP 3-30; and ALSA, TAGS.

addresses this challenge, proposing a set of recommendations that can be acted on in short order, as well as potential longer-term solutions and areas for further research.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Our Nation has come to expect much from its Air Force, and we will rise to the challenge of tomorrow's highly competitive environment to deliver — but to do so, we must accelerate change now!

—General Charles Q. Brown, *Accelerate Change or Lose*

Introduction

The analysis and findings presented in Chapter 4 outline a clear mandate for action to be taken if the identified problems are to be addressed—this is not lost on the Air Force. Leaders at the highest levels, civilian and military alike, have openly acknowledged many of the same issues outlined in this thesis. As a result, there has been a wide range of initiatives rolled out and experimentation conducted in recent years. In this chapter, the author will briefly review those initiatives which are relative to the discussion herein and assess how they might contribute to potential solutions. Once the context of on-going initiatives is laid out, recommendations for solutions will be provided, focusing specifically on those which can be achieved quickly, before finally, areas for future research and potential longer-term solutions are identified.

On-going Initiatives

This thesis represents a very narrow slice of a much broader command and control (C2) problem-set the Air Force is attempting to address. As such, many of the initiatives discussed here have implications that involve much more than the organization of the AOC and the Wing. With this in mind, the first initiative to discuss is Agile Combat Employment (ACE). ACE is the combined product of the Air Force's search for

solutions to the problems posed by peer adversaries and grassroots experimentation at the tactical level. The concept has changed frequently through its evolution, but the Air Force is beginning to consolidate the ACE effort and streamline its language. In fact, ACE is now being taught to Air C2 leaders and planners at the 505th Command and Control Wing,¹⁰¹ which defines ACE as a “proactive and reactive operational scheme of maneuver executed within threat timelines to increase survivability while generating combat power.”¹⁰²

The emphasis for ACE is to address all facets required for air forces to be able to operate in contested environments, one of which is C2. Within the ACE construct, there is an emphasis on mission command that addresses many of the concerns outlined in this thesis. For instance, flexible command relationships allow for more delegation of authority to lower levels of command. Also, during periods of disrupted C2, conditions-based authorities (CBAs) enable the rapid transfer of authority from the Air Component Commander (ACC) to other C2 nodes and back. Finally, the use of mission-type orders (MTOs) enables mission command when an air tasking order (ATO) cannot be disseminated. The ACE approach to Air C2 is certainly a significant shift in the right

¹⁰¹“The mission of the 505th Command and Control Wing is to shape the way joint and coalition warfighters execute command and control of multi-domain operations through experimentation, training, testing, evaluation, exercises, and tactics development.” 505th Command and Control Wing, “The 505th Command and Control Wing,” U.S. Air Force, accessed May 5, 2021, <https://www.505ccw.acc.af.mil/About-Us/Fact-Sheets/Display/Article/376114/the-505th-command-and-control-wing/>.

¹⁰² 505th Command and Control Wing, “ACE Training Primer,” (PowerPoint Presentation, Hurlburt Field, FL, July 7, 2020).

direction, especially as it is being taught to AOC leaders and planners. However, these ideas clearly have an impact on the Wing as well. This, too, the Air Force recognizes.

In October of 2020, Air Combat Command conducted its first ACE experiment, labeled “Agile Flag.” This exercise tested many aspects of ACE, including the “Lead Wing” concept, which the Air Force has been developing in response to the problems posed by peer competitors. This concept recognizes that most in-garrison Wings do not have the required infrastructure or combat power to prevail in peer conflict. Therefore, a Lead Wing is designated, under which a predetermined set of squadrons consolidate, many of them being pulled from other in-garrison Wings. This brings a wide range of air force units and capabilities together under a single wing commander that, ideally, train together in peacetime to prepare for an expeditionary deployment into a contested environment, should it be required. In Agile Flag 21-1, the Air Force put the Lead Wing concept into action and experimented with several of the concepts outlined in this thesis. Significant takeaways included the need for the Wing to have a Common Operating Picture (COP), the need for the Wing to employ a C2 element, and the need for clear guidance via CBAs.¹⁰³

Also tested within Agile Flag was an “A-staff” structure at the Wing level.¹⁰⁴ As discussed in Chapter 4, current Air Force regulation calls for Wings to be comprised of Groups, and Groups comprised of Squadrons. However, in an A-staff structure, the

¹⁰³ Lt Col Matthew P. Dale, *Agile Flag Experiment 21-1: After Action Report* (Nellis Air Force Base, NV: USAF Warfare Center, January 27, 2021).

¹⁰⁴ This structure has been in experimented with for the past several years with Mountain Home AFB as the focal point. However, Agile Flag marked a significant test of its role in an operational environment.

Group level of command is eliminated and replaced with a robust Wing staff. This staff is organized to align directly with the Air Force Forces (AFFOR) staff structure depicted in Figure 2. The A-staff structure flattens the Wing organization and empowers the Wing and Squadron commanders. While there are several promising aspects of this approach, it is not yet clear how the A-staff will impact the Wing's ability to execute C2. As one Wing subject-matter expert (SME) noted, the A-staff has put a strain on manning within the Wing as the Air Force tries to determine the right balance of personnel for the new structure..¹⁰⁵

Finally, of all the on-going initiatives which address Air C2, Joint All Domain Command and Control (JADC2) is the most significant. Beyond the purview of just Air C2, JADC2 envisions a future capability that connects sensors and shooters across all domains via a mesh network, thereby enabling speed in joint operational decision making that results in decision superiority over the enemy..¹⁰⁶ In researching this thesis, it was readily apparent that the Air Force has placed a significant amount of its research resources and brainpower into JADC2 development. While JADC2 has incredible potential, it is at least 14 years from being a reality. Furthermore, given the size and scope of JADC2, the program is likely to incur several challenges and delays along the way. Therefore, this thesis is intentionally not about JADC2—rather, it has been designed

¹⁰⁵ Maj Michael Lynch, “366 Fighter Wing SME Interview,” Telephone, March 30, 2021.

¹⁰⁶ John R. Hoehn, “Joint All-Domain Command and Control (JADC2),” (Congressional Research Service, Washington, DC, March 18, 2021), <https://crsreports.congress.gov/product/pdf/IF/IF11493>.

to help determine what can be done to address Air C2 concerns in the meantime, within the constraints of existing resources.

Recommendations

Based on the research conducted in this thesis and considering other on-going Air Force initiatives, the author submits three recommendations.

Recommendation #1: Elevate the Wing's Role in the Air C2 System

For the Wing to become an echelon capable of operating under the auspices of mission command, a mentality shift is required across the Air Force. Instead of being thought of as primarily a force provider, the Wing should be viewed as a self-contained fighting force capable of operating in high-end conflict through periods of isolation, if required. Obviously, this recommendation speaks to a culture change, a process that can take time to occur. However, several things can be done in short order to begin that process.

First, senior leaders should spread awareness. Through speeches, interviews, articles, conferences, and several other mediums, Air Force leaders have a powerful ability to set the narrative, especially in the technology age. Their advocacy for the Wing's role in the Air C2 system is the quickest way to generate the required mental shift across the Air Force. Second, update doctrine. As noted at the end of Chapter 4, the Wing is absent from Joint and Air Force C2 doctrine. Outlining the role of the Wing in the bedrock documents of Air C2 is essential to solidifying its role in the system. This also provides an opportunity to standardize the language that surrounds Air C2 functions. Last, update regulation. If the Wing is to have a C2 capability, that entity needs to

become a part of the standard Operational Wing organization outlined in Air Force Instruction 38-101.

Recommendation #2: Organize for Wing C2

For the Wing to carry out the necessary Air C2 enabling and execution functions, it must be organized to do so. This begins with making the Wing Operations Center (WOC) a standard organizational entity for all Operational Wings, both in-garrison and expeditionary. To clarify, the WOC would not need to be fully manned at all times. Rather, the standard WOC would be a skeleton structure to be built up when a contingency situation arises. The WOC would absorb existing entities such as the Wing command post (CP), planning cell (XP), intelligence shop, and others as needed, thereby generating C2 capacity without requiring any additional personnel. This approach certainly has its drawbacks, but the Wings currently experimenting with this option have demonstrated it to be an effective means of producing a WOC, even within the constraints of existing manpower and resources.

While the Air Force is still assessing the cost-benefit analysis of an A-staff at the Wing level, this construct may eventually contribute to increased C2 capacity for the Wing as well. In theory, efficiencies in manpower should be created by eliminating an echelon of command. Additionally, there is the potential for the A-staff and the WOC to work in tandem to produce a synergistic approach to Air C2, much in the same way an AFFOR staff interacts with an AOC. However, recent experiences at Agile Flag demonstrate challenges in achieving an optimal manpower solution for the A-staff. Further iterations of experimentation will be required to achieve the appropriate balance.

Last, Wing organization should plan for the incorporation of liaison officers (LNOs). For the Wing to execute Air C2 when disconnected from the AOC, it will need situational awareness regarding the location and activities of joint forces. In this scenario, sister-service LNOs would be essential to coordinate activities between forces. However, determining which LNOs are needed from what echelon of command would vary depending on the operation and area of responsibility (AOR)—and should be tailored as such. In addition to joint force LNOs, the Wing could benefit tremendously by receiving LNOs from the AOC. As noted in Chapter 4, it is typical for the Wing to send LNOs to the AOC, but the opposite case is not typical. Allowing for the Wing to receive LNOs from the AOC would create an efficient mechanism to spread Air C2 expertise where it is needed. For example, if a Wing's C2 capability is deficient in intelligence, assessments, and long-range planning, a handful of trained personnel from the AOC could be sent to the Wing to help build that capability.

Recommendation #3: Train to Wing C2

Once the Wing's role in Air C2 is solidified and it is organized to carry out the requisite Air C2 functions, the final step is for Wings to train to this capability. Clearly, it would be less than ideal if a Wing's first attempt to exercise Air C2 was in combat. Therefore, training to this capability while in-garrison is a must and it should occur in two primary areas: organizational processes and individual expertise. Training to organizational processes is something most Wings are very well versed in, especially those that regularly conduct operational readiness exercises. Utilizing existing training events, Wings should begin a crawl-walk-run approach to train to Air C2 processes. Key components of this training include establishing a WOC, identifying required manning

and expertise, developing standard operating procedures (SOPs), and determining relationships and communications plans.

In addition to the processes, the people also need to be trained. While a certain degree of individual training will occur via the actions outlined above, Wings should also develop specialized Air C2 expertise in individuals to enable the execution of Air C2 functions, especially the lacking monitor and assess functions. Examples include teaching Wing planners how to incorporate assessments and long-range planning considerations and training Wing intelligence professionals in targeting and PED.¹⁰⁷ Wing commanders will also need new training to clarify their role, responsibilities, and authorities in a mission command environment. Frequent interaction between the Air Component Commander and the Wing Commander is also essential to develop the trust required for mission command to succeed.

Other Viewpoints and Critiques

The recommendations above provide a set of achievable actions the Air Force can take in the near-term to build a more resilient Air C2 system and it can do so without material cost or additional resources. However, there are certainly other approaches to address the problems identified in this thesis and valid critiques of the recommendations provided. For instance, a widespread alternative viewpoint is one that believes in the primacy of the AOC. Thinkers in this camp view the AOC as the optimal product of Air C2's evolution through a history of lessons learned. Further, they view any attempt to move Air C2 capabilities away from the AOC as inherently wrong. Their answer to the

¹⁰⁷ This is already being experimented with at some Wings.

problems posed by peer adversaries is to double-down on the current Air C2 design; if it is vulnerable, then more investment is needed to protect it. They believe highly centralized control to be necessary for the effective employment of airpower. Indeed, anything that appears to represent a “mini-AOC” like capability is immediately rebuffed, as such an entity would decentralize Air C2, and therefore detract from the known best practice in the employment of airpower.

It is the author’s opinion that this camp represents the dogmatic approach to centralized control and decentralized execution discussed in Chapter 2, one which does not recognize the flexibility that the tenet was originally meant to embody. Furthermore, the range and number of threat capabilities possessed by peer competitors make the “double-down” strategy cost prohibitive—there are simply too many vulnerabilities in the current system for them all to be protected. In peer conflict, attacks against airbases, the AOC, and the Air C2 system are all but guaranteed. Therefore, a flexible and resilient approach to Air C2, even if it is less than optimal, is absolutely essential. It should also be said that the idea of generating a tailored C2 capability at the Wing level does not equate to the development of a “mini-AOC,” nor is that the intent. Rather, the goal is to determine the right degree of C2 required to enable mission command and doing so in a way that is fit for the purposes of the Wing. Such a C2 capability does not resemble the AOC in any meaningful way—not in structure, not in scope, not in responsibility or authority.

Perhaps the most significant critique of the recommendations provided is that of unintended consequences. While making changes to organizational structure seems simple enough on the surface, it is actually quite a complex endeavor, and in an attempt

to make things better, one may actually end up in a worse situation. Making the changes suggested here would certainly incur a degree of risk, yet change is necessary if a survivable Air C2 system is to be developed. Furthermore, the urgency of the threat posed by peer adversaries warrants the acceptance of that risk now—better to figure out what works and what does not during a period of peace than during a period of conflict.

Another potential critique is, despite appearing to have a net-zero manpower cost, Wing C2 will not work without adding more personnel. As one Air C2 SME noted in an interview, “there is a manpower bill that has to be paid somewhere.”¹⁰⁸ There is likely some truth to this critique as it is difficult to find any large organization in the Air Force that believes it is sufficiently manned. Personnel constraints will always be a reality. Nonetheless, early evidence from Wing experimentation suggests that organizing for Air C2 at the Wing level is achievable, even if it is far from perfect. As the Air Force progresses this concept from its nascency, a better balance will eventually emerge if by no other means than traditional trial-and-error.

Areas for Further Research

This study was limited in scope and leaves many areas that require greater exploration. As such, the following areas for further research are recommended.

Determine the “Right” Amount of Wing C2 Capability

This thesis has demonstrated that at least some C2 capability is required at the Wing level for the Air C2 system to function in peer conflict. However, as previously

¹⁰⁸ T. Beagle, “Air C2 SME Interview,” Telephone, February 10, 2021.

alluded to, the remaining question is how much C2 is needed to get the job done? Future researchers should explore this question and the second and third-order effects that result.

Cost Analysis of Material and Resource Requirements

The design of this study focused on organizational solutions within existing Air Force resource constraints. Future researchers should explore further possibilities of Wing C2 if the concept is provided additional resources, plus the costs that additional resourcing would incur.

Best Practices for Generating a COP at the Wing Level

One of the primary limiting factors for the realization of Wing C2 is the lack of a COP to provide situational awareness on air and surface forces alike. Future researchers should explore potential solutions for establishing a COP at the Wing level, such as piping in a COP from an external source, tying into a wider joint force COP network, or producing a COP organically.

Conclusion

The United States Air Force, along with its sister services and government partners, is at an inflection point. The challenges posed by a new era of great power competition layout a clear imperative, one which is captured well by the Chief of Staff of the Air Force in his letter to airmen labeled “accelerate change or lose.” As General Brown puts it, “If we don’t change—if we fail to adapt—we risk losing the certainty with which we have defended our national interests for decades . . . We risk losing quality

Airmen, our credibility, and our ability to secure our future.”¹⁰⁹ Indeed, accelerating change to the way the Air Force commands and controls air forces is fundamental to success in future conflicts. Doing so will require airmen to reconsider contemporary notions of centralized control and decentralized execution, looking for ways to be flexible in the application of Air C2 while staying true to the spirit of the tenet. Concepts like “distributed control” offer a blueprint for such thinking, yet ideas such as these and the wider conversation in the air community are quickly being overtaken by JADC2. The development of this future concept is certainly important work, but one should not lose sight what of can be done in the interim.

This thesis offers a way of thinking about Air C2 that reveals potential solutions. When Air C2 is broken down into a set of primary functions, then those functions are placed across the spectrum of air operations, a picture emerges that portrays what it truly means to command and control airpower. By identifying which essential activities comprise each function, depth is added to that understanding. This then becomes a foundation from which Air C2 can be analyzed. When the functions are used to help characterize and assess Air C2 as a system, it quickly becomes clear that greater C2 capacity is needed at the Wing level, a need that is driven specifically by the threat capabilities of peer adversaries. The functions then provide a frame that identifies the activities required to be performed for the Wing to produce a degree of C2. A modified Air C2 system, one which creates C2 capacity at the Wing level, strengthens and protects

¹⁰⁹ Gen Charles Q. Brown, *Accelerate Change or Lose*, U.S. Air Force, August 2020, 2, https://www.af.mil/Portals/1/documents/csaf/CSAF_22/CSAF_22_Strategic_Approach_Accelerate_Change_or_Lose_31_Aug_2020.pdf.

the seam that exists between the two primary echelons of air command. Such a system sets the conditions for mutual trust, delegation of authorities, and ultimately an empowered subordinate command capable of maintaining the initiative—a must for the Air Force to prevail in peer conflict.

BIBLIOGRAPHY

- 366th Fighter Wing Public Affairs. "ACC to Test New Wing Organization at Mountain Home AFB." U.S. Air Force, May 18, 2018. <https://www.af.mil/News/Article-Display/Article/1525552/acc-to-test-new-wing-organization-at-mountain-home-afb/>.
- 505th Command and Control Wing. "The 505th Command and Control Wing." U.S. Air Force. Accessed May 5, 2021. <https://www.505ccw.acc.af.mil/About-Us/Fact-Sheets/Display/Article/376114/the-505th-command-and-control-wing/>.
- . "ACE Training Primer." PowerPoint, Hurlburt Field, FL, July 7, 2020.
- . "AGILE FLAG 21-1 Conditions Based Authority Training." PowerPoint, Hurlburt Field, FL, October 22, 2020.
- 705th Training Squadron. "Agile Combat Employment Considerations for Planners." PowerPoint, Hurlburt Field, FL, January 13, 2021.
- Air Land Sea Application Center (ALSA). Air Force Tactics, Techniques, and Procedures 3-2.17, *TAGS: Multi-Service Tactics, Techniques, and Procedures for the Theater Air-Ground System*. Joint Base Langley-Eustis, VA: ALSA, 2020.
- Alkire, Brien, Sherrill Lingel, Caroline Baxter, Christopher Carson, Christine Chen, David Gordon, Lawrence Hanser, Lance Menthe, and Daniel Romano. *Command and Control of Joint Air Operations in the Pacific: Methods for Comparing and Contrasting Alternative Concepts*. RAND Corporation, 2018. Accessed November 11, 2020. https://www.rand.org/pubs/research_reports/RR1865.html.
- Beagle, T. "Air C2 SME Interview." Telephone, February 10, 2021.
- Boyd, John R. *A Discourse on Winning and Losing*. Edited by Dr. Grant T. Hammond. Maxwell Air Force Base, AL: Air University Press, 2018.
- Brown, Gen Charles Q. *Accelerate Change or Lose*. U.S. Air Force, August 2020. https://www.af.mil/Portals/1/documents/csaf/CSAF_22/CSAF_22_Strategic_Approach_Accelerate_Change_or_Lose_31_Aug_2020.pdf.
- Brown, Lt Gen CQ, and Lt Col Rick Fournier. "No Longer the Outlier: Updating the Air Component Structure." *Air & Space Power Journal* (Spring 2016): 4-15.
- Carlisle, Gen Herbert. "Pacific Air Forces: Command Strategy." PACAF/A5XC, January 2013.
- Carpenter, Col Trent R. "Command and Control of Joint Air Operations through Mission Command." *Air & Space Power Journal* (Summer 2016): 48-64.

- Clark, COL J. P., Lt Col Joe Broome, Lt Col Frank Franck Jr., and LTC Michael Loftus. *Command in Joint All-Domain Operations: Some Considerations*. Carlisle Scholars Program. Washington, DC: US Army War College, July 22, 2020.
- Costello, John. *Joint All-Domain Command and Control (JADC2) Information Paper*. JS/J6. Washington, DC: Joint Staff, September 18, 2020.
- Dale, Lt Col Matthew P. *Agile Flag Experiment 21-1: After Action Report*. Nellis Air Force Base, NV: USAF Warfare Center, January 27, 2021.
- Davis, Justin R. "The Centralized Control of Airpower in a Communications Black Hole." Master's Thesis, U.S. Army Command and General Staff College, Fort Leavenworth, 2020.
- Davis, Mark G. "Centralized Control/Decentralized Execution in the Era of Forward Reach." *Joint Force Quarterly*, no. 35 (October 2004): 95-99.
- Department of the Air Force. Air Force Doctrine Publication 1, *The Air Force*. Maxwell Air Force Base: Curtis E. Lemay Center for Doctrine Development and Education, 2021.
- . Air Force Doctrine Publication 3-30, *Command and Control*. Maxwell Air Force Base: Curtis E. Lemay Center for Doctrine Development and Education, 2020.
- . Air Force Instruction 13-103, *Air Component Headquarters AFFOR Staff Operations, Readiness and Structures*. Washington, DC: Department of the Air Force, 2020.
- . Air Force Instruction 38-101, *Manpower and Organization*. Washington, DC: Department of the Air Force, 2019.
- . Air Force Manual 10-207, *Command Posts*. Washington, DC: Department of the Air Force, 2018.
- . Department of the Air Force Manual 13-1, *Operational Procedures-Air Operations Center (AOC)/Operations Center (OC)*. Vol. 3. Washington, DC: Department of the Air Force, 2020.
- . *Global Vigilance, Global Reach, Global Power for America*. 2013. https://www.af.mil/Portals/1/documents/af%20events/2015/newGV_GR_GP_PRI NT.pdf.
- . "Summary of Adaptive Operations in Contested Environments." May 27, 2020.
- Deptula, David. "A New Era for Command and Control of Aerospace Operations." *Air & Space Power Journal* (Summer 2014): 5-16.

- Erwin, Sandra. "Pentagon Report: China Amassing Arsenal of Anti-Satellite Weapons." *SpaceNews*. Last modified September 1, 2020. Accessed February 17, 2021. <https://spacenews.com/pentagon-report-china-amassing-arsenal-of-anti-satellite-weapons/>.
- Fales, Lt Col, Maj Davenport, Maj Flannery, and Capt Schmidt. "Air Component Operational Command and Control of Major Combat Operations: A Brief Review of Essential Functions, Products & Contingencies." C2WAC Paper 21-02, 705th Training Squadron, Hurlburt Field, FL, January 28, 2021.
- Freedberg Jr., Sydney J. "Air Force to Train 'Lead Wings' for Major Wars; First Test Next Month." *Breaking Defense*, September 15, 2020. <https://breakingdefense.com/2020/09/air-force-to-train-lead-wings-for-major-wars-first-test-next-month/>.
- Gallei, Lt Col Francisco M. "The Roots of the Command and Control of Air Power: An Appraisal of Three Air Forces through 1945." Ph.D. diss., Air University, Maxwell Air Force Base, Montgomery, AL, 2014.
- Green, Maj Jacob, Maj Walter McDaniel-Brooks, Capt Anthony Williams, and Mr. Robin Daugherty. "Air Operation Center (AOC) Functions in a Contested, Degraded, and Operationally Limited (CDO) Environment." C2WAC Paper 21-02, 705th Training Squadron, Hurlburt Field, FL, January 28, 2021.
- Group 4. *C2WAC Writing Assignment*. C2WAC Paper 21-02. Hurlburt Field, FL: 705th Training Squadron, January 28, 2021.
- Harrigian, Gen Jeffrey L, Maj Gen Charles S Corcoran, Col Edward T Spinelli, and Col John C McClung. "Unfinished Business: Refining the Air Component Structure." *Air & Space Power Journal* (Winter 2019): 4-10.
- Hartoin, Nathan. "48 Fighter Wing SME Interview." Email, May 5, 2021.
- Hinote, Lt Col Clint. "Centralized Control and Decentralized Execution: A Catchphrase in Crisis?" Research Paper 2009-1, Air Force Research Institute, Maxwell Air Force Base, Montgomery, AL, 2009.
- Hitchens, Theresa. "'Bold Quest' To Demo Allied Connectivity for All-Domain Ops." *Breaking Defense*, August 24, 2020. <https://breakingdefense.com/2020/08/bold-quest-to-demo-allied-connectivity-for-all-domain-ops/>.
- Hoehn, John R. "Joint All-Domain Command and Control (JADC2)." Congressional Research Service, Washington, DC, March 18, 2021. <https://crsreports.congress.gov/product/pdf/IF/IF11493>.

- Hostage III, Gilmary Michael, and Larry R Broadwell. "Resilient Command and Control: The Need for Distributed Control." *Joint Force Quarterly*, no. 74 (July 2014): 38-43.
- J., S. "What Are Hypersonic Weapons?" *The Economist*, January 3, 2019. Accessed February 17, 2021. <https://www.economist.com/the-economist-explains/2019/01/03/what-are-hypersonic-weapons>.
- JADC2 Cross Functional Team. "Joint All-Domain Command and Control (JADC2) Overview." PowerPoint Presentation, Washington, DC, January 2021.
- Justice III, Joseph H. "Airpower Command and Control: Evolution of the Air and Space Operations Center as a Weapon System." Master's Thesis, US Army War College, Carlisle Barracks, PA, 2004. Accessed January 20, 2021. <http://www.dtic.mil/docs/citations/ADA423705>.
- Korolev, Alexander. "On the Verge of an Alliance: Contemporary China-Russia Military Cooperation." *Asian Security* 15, no. 3 (2019): 233-252.
- Krause, Michael. *Historical Perspectives of the Operational Art*. Washington: Center for Military History, 2005.
- Kuehl, Daniel T., and Charles E. Miller. "Roles, Missions, and Functions: Terms of Debate." *Joint Force Quarterly*, no. 4 (May 1994): 103-105.
- Leslie, TSgt Carlin. "ACC to Conduct Experiment Testing Agility and Lead Wing Concepts during AGILE FLAG 21-1." Air Combat Command. Last modified October 21, 2020. Accessed May 5, 2021. <https://www.acc.af.mil/News/Article-Display/Article/2387947/acc-to-conduct-experiment-testing-agility-and-lead-wing-concepts-during-agile-f/fbclid/IwAR0MOMfiauP9yjnFsA99kzVdtc7HnNzJXGt6Jw5jjGXMIR8etV8Qfzz4Ttk/>.
- Looby, Maj Patrick. "20 Fighter Wing Interview." Telephone, April 6, 2021.
- Lynch, Maj Michael. "366 Fighter Wing SME Interview." Telephone, March 30, 2021.
- Manyin, Mark E., Stephen Daggett, Ben Dolven, Susan V. Lawrence, Michael F. Martin, Ronald O'Rourke, and Bruce Vaughn. *Pivot to the Pacific? The Obama Administration's "Rebalancing" Toward Asia*. Congressional Research Service Report for Congress. Washington, DC: Library of Congress, March 28, 2012.
- McLean, Brian. "Reshaping Centralized Control / Decentralized Execution for the Emerging Operating Environment." *Over the Horizon Journal*, March 13, 2017. Accessed October 12, 2020. https://othjournal.com/2017/03/13/reshaping-cc-dc-de/?subscribe=success#blog_subscription-15.
- McNabb, Maj Shawn. "18 Wing SME Interview." Email, March 15, 2021.

- Meilinger, Col Phillip S. *10 Propositions Regarding Air Power*. Washington: Air Force History and Museums Program, 1995.
- Mele, Cristina, Jacqueline Pels, and Francesco Polese. “A Brief Review of Systems Theories and Their Managerial Applications.” *Service Science* 2, no. 1–2 (June 2010): 126-135.
- Merriam, Sharan B., and Elizabeth J. Tisdell. *Qualitative Research: A Guide to Design and Implementation*. 4th ed. The Jossey-Bass higher and adult education series. San Francisco, CA: John Wiley & Sons, 2015.
- Merriam-Webster. “Function.” Accessed February 18, 2021. <https://www.merriam-webster.com/dictionary/function>.
- Mortensen, Dr. Daniel R., and Lt Col Jeffrey Hukill. “Developing Flexible Command and Control of Airpower.” *Air & Space Power Journal* (Spring 2011): 53-63.
- Office of the Chairman of the Joint Chiefs of Staff. Joint Publication 1, *Doctrine for the Armed Forces of the United States*. Washington, DC: Joint Chiefs of Staff, 2017.
- . Joint Publication 3-30, *Joint Air Operations*. Washington, DC: Joint Chiefs of Staff, 2019.
- Office of the Secretary of Defense. *Military and Security Developments Involving the People’s Republic of China*. Annual Report to Congress. Washington, DC: Department of Defense, 2020.
- O’Malley, Derek, and Andrew Hill. “The A-10, the F-35, and the Future of Close Air Support.” *War on the Rocks*. Last modified May 27, 2015. Accessed February 3, 2021. <https://warontherocks.com/2015/05/the-a-10-the-f-35-and-the-future-of-close-air-support-part-i/>.
- Parker, Col Kevin L. “Thinking Differently about Air Bases: Evolving with the Evolving Strategic Environment.” *Air & Space Power Journal* (Fall 2019): 52-68.
- Pietrucha, Mike, and Jeremy Renken. “Bringing the Air Division Back to the Future.” *War on the Rocks*. Last modified April 22, 2019. Accessed February 16, 2021. <https://warontherocks.com/2019/04/bringing-the-air-division-back-to-the-future/>.
- Priebe, Miranda, Alan Vick, Jacob Heim, and Meagan Smith. *Distributed Operations in a Contested Environment: Implications for USAF Force Presentation*. RAND Corporation, 2019. Accessed November 7, 2020. https://www.rand.org/pubs/research_reports/RR2959.html.

- Rempfer, Kyle. "Bombers, Fighters and Tankers Unite: Will the Air Force Rebuild Composite Wings to Fight near-Peer Foes?" *Air Force Times*, September 17, 2018. <https://www.airforcetimes.com/news/your-air-force/2018/09/18/bombers-fighters-and-tankers-unite-will-the-air-force-rebuild-composite-wings-to-fight-near-peer-foes/>.
- Rutkovitz, Maj Jared, Maj Trenton Updike, Maj Ernie Carcamo, and MSgt Patrick Conlisk. "Sustaining Air Operations during Major Combat Operations with a Peer/Near Peer Adversary." C2WAC Paper. 21-02, 705th Training Squadron, Hurlburt Field, FL, January 28, 2021.
- Secretary of Defense. Department of Defense Directive 5100.01, *Functions of the Department of Defense and Its Major Components*. Washington, DC: Department of Defense, 2020.
- . "Summary of the 2018 National Defense Strategy of the United States of America," 2018. <https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf>.
- Sundberg, Jeffrey. "Analyzing the United States Air Force Organizational Structure - A Case for Reorganization." Monograph, School of Advanced Military Studies, U.S. Army Command and General Staff College, Fort Leavenworth, KS, 2011.
- Szayna, Thomas S., Daniel L. Byman, Steven C. Bankes, Derek Eaton, Seth G. Jones, Robert E. Mullins, Ian O. Lesser, and William Rosenau. *The Emergence of Peer Competitors: A Framework for Analysis*. Santa Monica, CA: RAND Corporation, 2001.
- Theriault, Maj Eric. "Empowered Commanders: The Cornerstone to Agile, Flexible Command and Control." *Air & Space Power Journal* (Winter 2015): 99-111.
- Thrasher, Roger D. "The War Fighter's Command and Control Reading List." Thesis, Air Command and Staff College, Maxwell Air Force Base, Montgomery AL, 1999.
- U.S. President. *National Security Strategy of the United States of America*. Washington, DC: December 2017. <https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf>.
- Verbarendse, Maj Steven. "3 Fighter Wing SME Interview." Email, March 25, 2021.
- Winnefeld, James A., and Dana J. Johnson. *Joint Air Operations: Pursuit of Unity in Command and Control, 1942-1991*. A RAND research study. Annapolis, MD: Naval Institute Press, 1993.