U.S. ARMY AIRSPACE COMMAND AND CONTROL AT ECHELONS ABOVE BRIGADE

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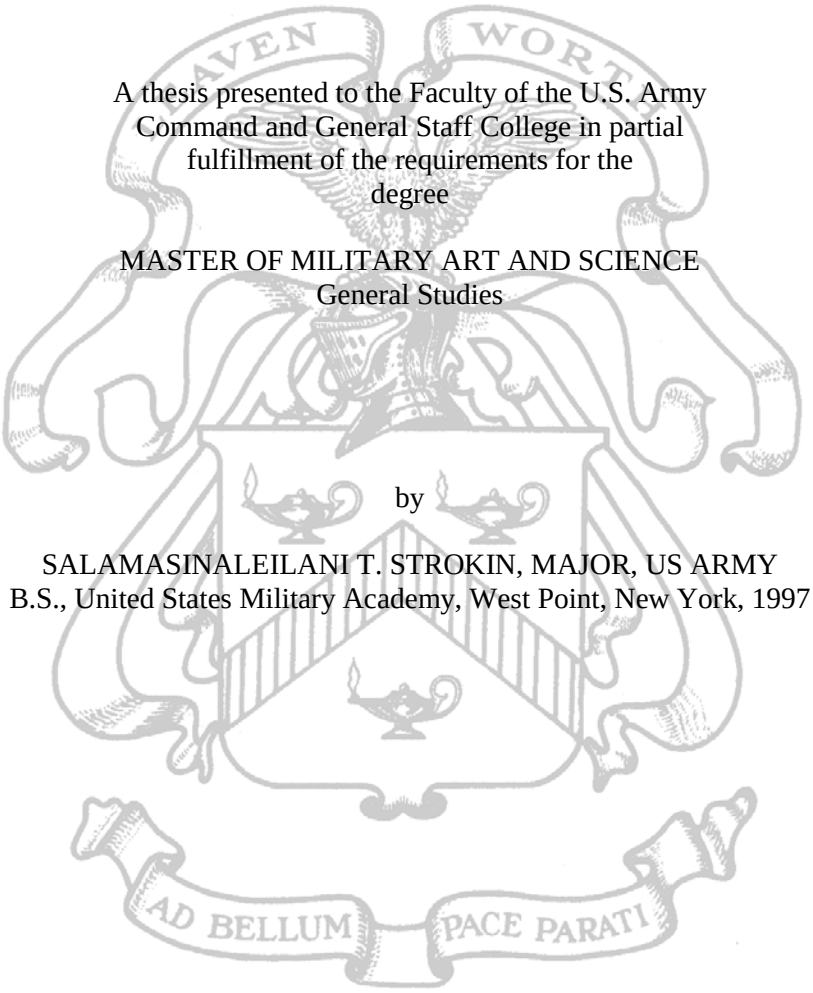
General Studies

by

SALAMASINALEILANI T. STROKIN, MAJOR, US ARMY
B.S., United States Military Academy, West Point, New York, 1997



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The purpose of Airspace Command and Control (AC2) is to maximize the efficiency of all airspace users conducting simultaneous combat operations in support of the commander's intent. Effective AC2 requires successful identification, coordination, integration, and regulation of all airspace users through the AC2 activities of command and control, air defense, fire support, air traffic control, aviation, and airspace management. AC2 sections at division and above are minimally trained and equipped to perform the activities of AC2 adequately and independent of each other but not as a unified section, nor are they doctrinally required in a centralized organizational structure. This is compounded by other inefficiencies in the current doctrine and structure of the AC2 sections that include manpower shortages, deficient airspace user, and AC2 training. Additionally, the proliferation of Unmanned Aircraft Systems (UAS), fielding of fires platforms with greater and higher ranges, and the need to integrate civilian and non-governmental organizations into combat operational environments add further strains on and complexities to the airspace management system. This study examines inconsistencies or omissions in joint or service doctrine, organization structures, and training. It also offers recommendations to increase the effectiveness of AC2 sections at and above the division level.

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Name of Candidate: MAJ Salamasinaleilani T. Strokin

Thesis Title: U.S. Army Airspace Command and Control at Echelons Above Brigade

Approved by:

_____, Thesis Committee Chair
William D. Kuchinski, M.E.

_____, Member
Edward D. Jennings, M.S.

_____, Member
Yvonne Doll, D.M.

Accepted this 11th day of June 2010 by:

_____, Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

U.S. Army Airspace Command and Control at Echelons Above Brigade, by MAJ Salamasinaleilani T. Strokin, 89 pages.

The purpose of Airspace Command and Control (AC2) is to maximize the efficiency of all airspace users conducting simultaneous combat operations in support of the commander's intent. Effective AC2 requires successful identification, coordination, integration, and regulation of all airspace users through the AC2 activities: command and control, air defense, fire support, air traffic control, aviation, and airspace management. AC2 sections at division and above are minimally trained and equipped to perform the activities of AC2 adequately and independent of each other but not as a unified section, nor are they doctrinally required in a centralized organizational structure. This is compounded by other inefficiencies in the current doctrine and structure of the AC2 Sections that include manpower shortages, deficient airspace user, and AC2 training. Additionally, the proliferation of Unmanned Aircraft Systems (UAS), fielding of fires platforms with greater and higher ranges, and the need to integrate civilian and non-governmental organizations into combat operational environments add further strains on and complexities to the airspace management system. This study will examine inconsistencies or omissions in joint or service doctrine, organization structures, and training. It also offers recommendations to increase the effectiveness of AC2 sections at and above the division level.

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ACRONYMS

AC2	Airspace Command and Control
ACA	Airspace Control Authority
ACP	Airspace Control Plan
ACS	Airspace Control System
ADAM	Air Defense and Airspace Management
ADSI	Air Defense Systems Integrator
AMDWS	Air and Missile Defense Workstation
AO	Area of Operations
AOC	Air and Space Operations Center
ASOC	Air Support Operations Center
ATO	Air Tasking Order
BCTP	Battle Command Training Program
C2	Command and Control
CALL	Center for Army Lessons Learned
CRC	Control and Reporting Center
CTC	Combat Training Center
DOTMLPF	Doctrine, Organization, Training, Military Leadership, Personnel, and Facilities
FM	Field Manual
ISR	Intelligence, Surveillance, and Reconnaissance
JAOC	Joint Air and Space Operations Center
JACCE	Joint Air Component Coordination Element
JAGIC	Joint Air Ground Integration Cell
JFACC	Joint Forces Air Component Commander

JFC	Joint Force Commander
JP	Joint Publication
JTF	Joint Task Force
JUONS	Joint Urgent Operational Needs Statement
MAGTF	Marine Air Ground Task Force
MNC-I	Multi-National Corps -- Iraq
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
SUAS	Small Unmanned Aircraft Systems
TACS	Theater Air Control System
TAIS	Tactical Airspace Integrations System
TAGS	Theater Air Ground System
TBMCS	Theater Battle Management Core Systems
TF	Task Force
TTP	Tactics Techniques Procedures
UAS	Unmanned Aircraft System
UAV	Unmanned Aerial Vehicle
U.S.	United States

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CHAPTER 1

INTRODUCTION

The purpose of this study is to examine Airspace Command and Control (AC2) at the division level and above and provide recommendations on how the doctrine governing AC2, its current organizational structure, and the training of personnel involved with airspace operations can most effectively support military operations. Army Field Manual (FM) 3-52, *Army Airspace Command and Control in a Combat Zone,* and Joint Publication (JP) 3-52, *Joint Doctrine for Airspace Control in a Combat Zone* cite the definition of airspace control as a "process used to increase combat effectiveness by promoting the safe, efficient, and flexible use of airspace. Airspace control is provided in order to reduce the risk of friendly fire, enhance air defense operations, and permit greater flexibility of operations" (Headquarters, Department of the Army 2002, 4). In order for commanders to maximize the use of airspace most effectively, they must prudently manage the airspace users and all airspace operations. The operational approach of controlling airspace is AC2. AC2 functions and activities enhance the ability of commanders to manage joint forces and synchronize the joint forces' use of the airspace. The basic doctrinal functions of AC2 are identification, coordination, integration, and regulation. When the four functions are efficiently operating, the functions afford the successful accomplishment of the "five basic and indivisible activities" of AC2: command and control, fire support coordination, air defense, air traffic control, and airspace management (Headquarters, Department of the Army 2002, 50).

The operational environment over the past decade has grown increasingly more complex as there are far more systems saturating the airspace from multiple services and multiple nations, governmental and non-governmental, manned and unmanned systems operating below the coordinating altitude. The complex airspace requires an improved airspace control capability. To manage multiple operations safely across a contiguous battlefield comprised of multiple users also requires enabling equipment, trained equipment operators, trained airspace users, and trained airspace managers in an organization configured to perform the functions and activities of AC2. The organizational AC2 elements at the division level and above are not structured or equipped to perform the basic AC2 function of being able to "identify all the airspace users" efficiently (Headquarters, Department of the Army 2002, 49). The fundamental ability to identify all airspace users is the most basic of the AC2 functions and is critical in being able to synchronize multiple airspace users and operations in an ever increasingly complex environment.

There are several defeciencies that currently hinder the AC2's ability to command and control airpsace users efficiently. The United States military paradigm has shifted over the past decade from conventional to counter-insurgency operations encompassed in the foundational concept of full spectrum operations. The best tactics, techniques, and procedures relating to the roles and responsibilities of AC2 in full spectrum operations have yet to be incorporated into doctrine. The primary doctrinal manuals for and the initial iterations of AC2, FM 3-52 and JP 3-52, were developed prior to the military's paradigm shift to full spectrum operations. FM 3-52 and JP 3-52 were initially released when there was traditionally more time to plan and disseminate airspace procedures in

support of high intensity conflicts. The initial versions of both these publications were broad in nature to support high intensity conflict and focused more on deconfliction of airspace users versus the integration and synchronization of multiple assets. Historically, airspace control relied heavily on assigning sections of airspace to one airspace user at a time and required a current operations section to monitor the user, ensuring they remained within their confined space. However, the current operating system requires a much more responsive system, one that is able to maximize the combat effectiveness of all the airspace users while decreasing the risk associated with saturated airspace.

Additionally, at echelons above the Army brigade headquarters, no formal AC2 stucture exists. Current doctrine only refers to ad hoc airspace elements at the division and above that will perform AC2 functions. Air operations in support of full spectrum operations are much more dynamic and require a greater capability to support immediate taskings and retaskings. Airspace operations require more responsive airspace control management capability as the operations are generally more immediate and time sensitive. Furthermore, the proficiency and training of not only personnel charged with airspace management, but the training of the airspace users and their respective command's awareness of their impact on other airspace users, is inconsistent and often lacking. Effective AC2 requires the ability to supervise operations real-time or near real time and facilitate the execution of the AC2 functions and activities.

Problem Statement

The purpose of the AC2 section at all levels is to maximize the efficiency of all airspace users conducting simultaneous combat operations in support of the commander's

intent. Effective AC2 requires the successful identification, coordination, integration, and regulation of all airspace users through command and control, air defense, fire support, air traffic control, aviation, and airspace management activities. The problem is that there is a significant increase in airspace users, multiple supported commanders, often within the same operational environment, doctrinal disconnects, a lack of reliable communications, and an inability to attain an accurate operating picture. These problems result in ad hoc organizations and processes at the division level and above. The AC2 activities at division and above are rarely trained in their independent staff sections. The AC2 activities are even less frequently trained in their staff sections as part of a combined or joint team, the environment in which they are required to perform in.

The lack of doctrine mandating institutionalized training, providing specific guidance and authority to AC2 sections, the lack of a standardized structure at and above the division level, and an inconsistent or the complete lack of training for AC2 section members and airspace users are at the root of several AC2 inefficiencies. These inefficiencies are further compounded in the current structure of the AC2 sections by manpower shortages, and incompatible equipment to manage airspace effectively in support of operations at echelons above the division level. Equipment deficiencies include the current fielded equipment's inability to see and communicate with all the airspace users at multiple altitudes before, during, and after operations. The equipment deficiencies also refer to the equipment's and the users' inability to facilitate communications between all airspace users. Problems are encountered with the airspace users' ability to communicate to an AC2 section, to communicate between the systems within the AC2 section, and to communicate up and down the AC2 hierarchy. The

equipment and communication deficiencies additionally refer to interoperability issues or the lack of common processes and products, like a common reference system adapted by and applicable to all users in all situations. A reference system used by all services to convey location or target position at any altitude quickly, to include positions on the ground, would facilitate all of the AC2 functions: identification, coordination, integration and regulation. A common reference system adopted by all military users would bridge many gaps and increase the services' overall situational awareness and understanding with relation to the battlefield and operations within it (Headquarters, Department of the Army 2002, 4-12).

Additional strains and complexities of the airspace management system include the proliferation of Unmanned Aircraft Systems (UAS), fielding of fires platforms with greater and higher ranges, and the requirement to integrate civilian and non-governmental organizations into combat operational environments. These factors grow more complex as military operations sometimes become secondary to geopolitical and commercial economic factors. Specifically when the military transitions to Phase IV, stabilization operations, and Phase V, enabling civil authority operations, legitimizing a country's sovereignty takes greater precedence in achieving overall strategic objectives (Joint Chiefs of Staff 2006, IV-29).

The operational environment has become more saturated with airspace users at lower echelons and requires more coordination with multiple agencies. As the operational environment continues to grow more complex, so does the airspace. It becomes even more critical to understand the functions, capabilities, and limitations of the airspace users and each organization in order to maximize the effectiveness of their employment.

A clear AC2 structure must be established, adhered to, and supported by all airspace users at all echelons. When the Airspace Command Authority (ACA) delegates AC2 authority to tactical commands, a cohesive and centralized AC2 structure is even more imperative in facilitating freedom of action during decentralized execution. The ACA commands a joint airspace section although the subordinate AC2 structures to whom ACA authority is delegated usually is not a joint structure and often works autonomously from other services.

Primary Research Question

How can the functionality and organization of the AC2 at echelons above the brigade be improved to increase its effectiveness, efficiency, and the overall safety of airspace operations?

Secondary Research Questions

1. Should the joint community implement a joint modular system that is flexible and scalable based on the operational environment?

2. Is the AC2 sections authorized personnel strength at echelons above the brigade sufficient to conduct any operation in the realm of full spectrum operations?

3. What doctrine and training is the U.S. Army lacking with respect to AC2 and at what levels is the doctrine and training lacking?

Assumptions

1. AC2 members find intergating and synchronizing airspace in a full spectrum operational environment challenging.

2. No single airspace formation will be applicable to every or any operational environment.

3. No progress has been made on the approved Joint Urgent Operational Needs Statement (JUONS) in Operation Iraqi Freedom (OIF) with regard to improving the safe operations of a multitude of airspace operations at low altitudes.

4. New equipment (aircraft sense and avoid and extended range communications) is still more than three years from initial fielding.

Limitations

With regard to the inefficiencies in AC2, all the facets of doctrine, organization, training, materiel, leadership, personnel, and facilities (DOTMLPF) contribute to the problems. The scope of this research will focus upon the elements of doctrine, organization, and training. The scope of the research is also limited to operations within the past decade as most of the significant advances and inefficiencies are highlighted during this period. Additionally, some of the information contained in this thesis was extracted from For Official Use Only after action reviews and lessons learned from units at Combat Training Centers (CTCs) and previously deployed units in OIF and Operation Enduring Freedom (OEF). Specific information on recent operations is inaccessible due to the security classification.

Definition of Terms

Important to understanding AC2 is a firm comprehension of the functions and activities of AC2. Beginning with the paramount AC2 function of identification, it is the ability to literally identify all airspace users from fires operations to UAS operations, in

order to coordinate and integrate all users most effectively. Coordination is “the exchange of information to inform, synchronize, and deconflict operations” (Headquarters, Department of the Army 2002, 49). FM 3-52 defines integration as “the consolidation of airspace requirements and assets beginning at the lowest echelon possible and with the correct organization” (Headquarters, Department of the Army 49). FM 3-52 states that integration embraces the lowest levels up to the highest echelons to unite the multiple systems from all services, nations, and sources. JP1-02 defines integration as “the arrangement of military forces and their actions to create a force that operates by engaging as a whole” (Joint Chiefs of Staff 2001, 266). The final AC2 function regulation is the “application of promulgated rules and procedures on all airspace users” (Headquarters, Department of the Army 2002, 49).

Airspace control is achieved through both procedural and positive control. Procedural control is the primary means in which the Army historically managed airspace because of its limited means to provide positive control. Procedural control relies on previously agreed to procedures such as the use of airspace coordination measures which places great trust in all the airspace users to report accurately, and adhere to all airspace procedures. On the other hand, positive control relies on sensors and radars to provide accurate and timely confirmation of airspace users in order to “positively identify, track, and direct air assets” (Joint Chiefs of Staff 2004, 11). See figure 1.

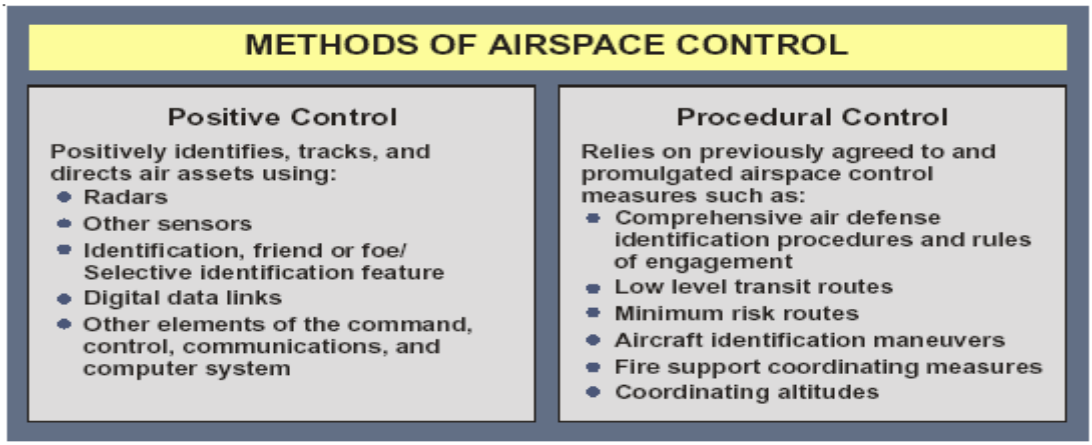

Figure 1. Methods of Airspace Control
Source: Joint Chiefs of Staff, *Command and Control for Joint Air Operations* (Washington, DC: GPO, 2007), II-5

JP 1-02 defines command and control (C2) systems as "the facilities, equipment, communications, procedures, and personnel essential to a commander for planning, directing, and controlling operations of assigned and attached forces pursuant to the missions assigned" (Joint Chiefs of Staff 2007, 101). This thesis will not expound upon facilities, equipment, and communications of AC2, although they are vital for any C2 system. This thesis will explore the joint organization that link the personnel and procedures required for an efficient AC2 system by analyzing existing doctrine, organizational AC2 structures and AC2 training. JP 1-02 also defines "joint" as those "activities, operations, organizations, etc., in which elements of two or more military departments participate" (Joint Chiefs of Staff 2007, 103). Within the context of this study, '*joint*' also refers to integrated service capabilities and employment. JP 3-30 defines joint air operations as "air operations performed with air capabilities/forces made available by components in support of the joint force commander's operation or

campaign objectives, or in support of other components of the joint force" (Joint Chiefs of Staff 2010, GL-10).

Significance of Thesis

Reiterating previous sentiment, there was a drastic increase in the complexity of the airspace over the past decade. Specifically, while executing and training full spectrum operations, doctrinal deficiencies, non-standardized organizational structures at echelons above brigade, and inadequate AC2 training of personnel have increased the complexity of conducting AC2 effectively and efficiently. Additionally, there is no mandated horizontal C2 authority facilitating communications among all of the activities of AC2. Effective collaboration between all airspace stakeholders is imperative in maximizing combat efficiency, situational understanding, and dramatically decreasing the risk of airspace operations in such a congested environment. Therefore, the need to address and improve current inefficiencies is imperative, before a catastrophic event occurs.

Summary

AC2 systems were initially developed in support of major combat operations focused at the theater level when there was not a significant need for designated guidance, defined roles and responsibilities or authority at lower echelons. There still is no C2 authority at the subordinate echelons facilitating horizontal integration and coordination of airspace activities, nor is there a C2 authority facilitating operations down to the lowest tactical level. This study will examine the deficiencies in joint and service doctrine, the doctrinal and conceptual AC2 organizations, and the training available and required to increase the efficiency of the AC2 at the division and corps. These

deficiencies result in ad hoc organizations and processes. The deficiencies also lead to an increased operational risk as depicted by figure 2 with the saturation of airspace operations.

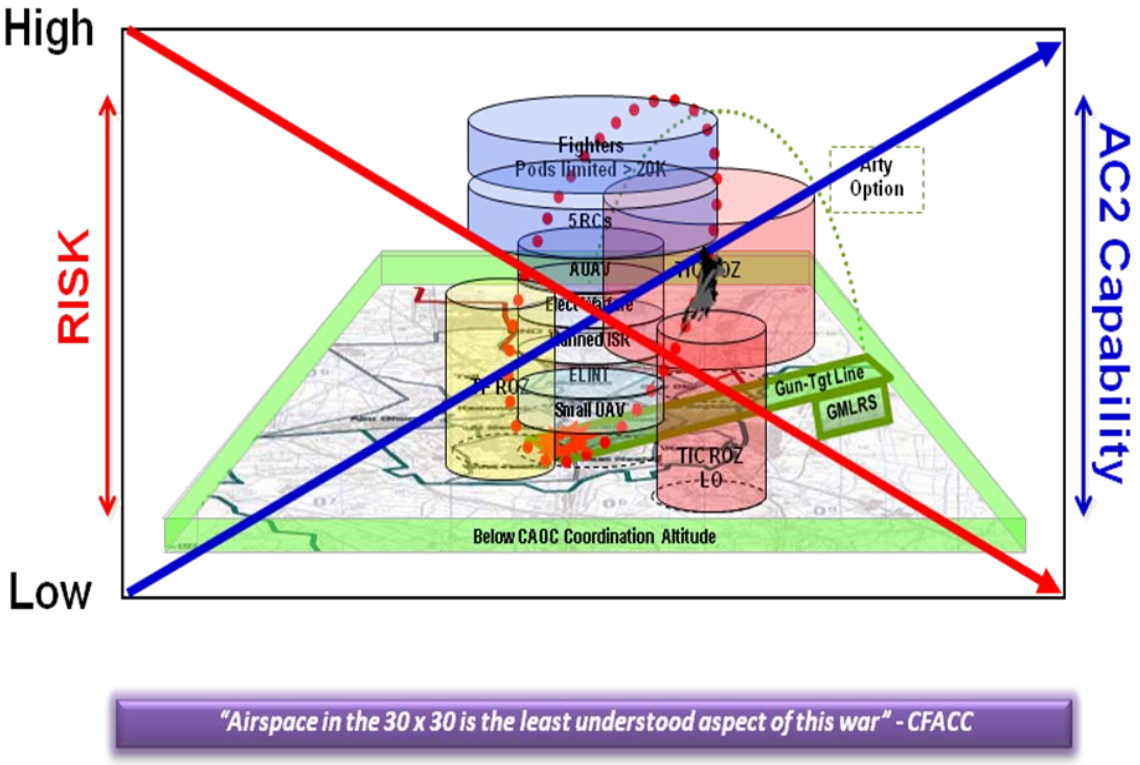

Figure 2. AC2 Capability

Source: Curtis Neal, *Joint Air Ground Combat Division* (Washington, DC: GPO, 2007), 5.

CHAPTER 2

LITERATURE REVIEW

The purpose of this literature review is to determine what doctrine, organizational structure, and training is available and should be required to facilitate the effective airspace management and the coordination and integration of multiple airspace users. Although there are many publications that discuss the numerous platforms congesting the airspace, relatively little is published on how to manage these assets operating in a saturated environment. The focus of current literature appears to deal with accumulating expertise regarding the employment of assets, emerging capabilities, and future application. Most literature focuses less on the management of assets. These sources tend to overlook the systems' integration and interoperability capabilities and casually mention how the systems interact with a limited number of other airborne assets in addition to describing where the systems should fit into the existing airspace architecture. The intent of this chapter is to review current literature and compare it with current doctrine, documented tactics, techniques, and procedures in order to clarify disparities with regard to airspace management.

The review focused on literature that pertained to doctrinal guidance and the regulation of AC2, organizational structures, and the training mandated or required of airspace users and AC2 managers. The literature review begins with a study of doctrine, first looking at joint publications then service manuals and regulations. Second, the review highlights current AC2 organizations to include the equipment within organizations that facilitate AC2. Finally, the review provides an overview of the training

available to airspace users and managers. Following the general overview of doctrine, the AC2 organization and training related to AC2, the chapter highlights trends, recommendations, and conflicts or gaps in literature. The four types of literature most significant to the research were: (1) joint and service doctrine, (2) Center for Army Lessons Learned (CALL) publications, (3) Senate and House of Representative testimonials, and (4) the RAND Corporation's Air Force papers.

Doctrinal Review

Joint Doctrine

This portion of the literature review will examine what doctrinal guidance is provided to AC2, the AC2 structural organization, and associated AC2 training. Beginning with JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, it defines doctrine as the "fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives. It is authoritative but requires judgment in application" (Joint Chiefs of Staff 2007, 166).

JP 0-2, *Unified Action Armed Forces (UAAF)*, provides limited guidance in its effort to enhance joint activities in joint operations, particularly of air ground operations. JP 0-2 defines unified action as a broad scope activities that "synchronizes and/or integrates joint, single-service, special, multinational, and supporting operations with the operations of government agencies, NGOs, and IOs to achieve unity of effort in the operational area" (Joint Chiefs of Staff 2001, viii). The broad scope of activities JP0-2 refers to are the areas in which AC2 is encountering the most challenges integrating. JP 0-2 continues on to designate several responsibilities and authorities to commanders but

not to C2 cells within the command. The publication charges the services with achieving the "Integration of the Armed Forces into an effective and efficient team of land, naval, air, space, and special operations forces" but does not state or recommend how to do so (Joint Chiefs of Staff 2001, II-2). Specifically, there is no mention of an integrated C2 cell to facilitate collaboration.

Despite discussions of service integration JP 0-2 states that the Marine Corps retains operational control of its organic air assets for Marine Air Ground Task Force (MAGTF) operations while making sorties available to the Joint Force Commander (JFC) for tasking as needed. The MAGTF is the basic formation in which Marines deploy modular and tailorable AC2 systems and always in a combined arms configuration. The basic components of a Marine Air-Ground Task Force include a C2 element, an aviation element, a ground element, and a combat service support element. JP 0-2 states its purpose is to attempt to formally integrate the Services' assets and operations, but then contradicts itself by allowing operational control of all air assets to the MAGTF. JP 0-2 does not mandate an AC2 organization or agency to facilitate airspace control or to promote communications between the Services' air ground operations. JP -02 does not mandate the integration of Services or AC2 activities either (Joint Chiefs of Staff 2001).

JP 1, *Doctrine for the Armed Forces of the United States*, states it is the capstone publication for all joint doctrine and guides the Armed Forces of the United States on the employment of the Armed Forces. JP 1 defines command and control as "the means by which a joint force commander synchronizes and/or integrates joint force activities in order to achieve unity of command" (Joint Chiefs of Staff 2007, xvi). JP 1 defers the responsibility of organizing, training, and equipping forces to execute missions

worldwide tied to the National Security Strategy and National Military Strategy to the respective services. However, the extent of guidance provided by JP 1 with regard to airspace operations or air ground integration guidance is best summed up by the following guidance, “Those who will lead joint forces must develop skill in orchestrating air, land, sea, space, and special operations forces into smoothly functioning joint teams” (Joint Chiefs of Staff 2000, III-5). JP 1 does not elaborate any further on how to orchestrate multiple operations, nor does it designate roles and responsibilities to a particular agency or outline training to suggest how to accomplish the daunting task.

JP 3-0, *Joint Operations*, speaks to the physical areas of the air, land, maritime, and space domains and expounds upon the six phases of joint military operations. The six joint military phases are numbered zero through five and consist of shape, deter, seize initiative, dominate, stabilize, and enable civil authority respectively. JP 3-0 highlights the need for certain air operations during each phase to include achieving full spectrum superiority, “The cumulative effect of dominance in the air, land, maritime, and space domains and information environment that permits the conduct of joint operations without effective opposition or prohibitive interference is essential to joint force mission success” (Joint Chiefs of Staff 2006, v-13). However, JP 3-0 does not provide guidance or clearly delineate roles or responsibilities of AC2 during each joint military phase or address how the air domain should be structured.

Airspace requirements greatly differ throughout the military phases of operation. Civil and host nation constraints become much more prevalent as military operations are forced to operate under greater regulation and scrutiny. The doctrine further alienates

airspace managers by completely deferring to the ground commanders in the establishment of Area of Operations (AO):

> JFCs establish land and maritime AOs to decentralize execution of land and maritime component operations, allow rapid maneuver, and provide the ability to fight at extended ranges. The size, shape, and positioning of land or maritime AOs will be based on the JFC's Concept of Operations (CONOPS) and the land or maritime commanders' requirements to accomplish their missions and protect their forces. (Joint Chiefs of Staff 2006, v-21)

JP 3-0 notably designates the land and maritime commanders as the supported commander "for the integration and synchronization of maneuver, fires, and interdiction. Accordingly, land and maritime commanders designate the target priority, effects, and timing of interdiction operations within their AOs" (Joint Chiefs of Staff 2006, V-21). JP 3-0 does not suggest or recommend the delegation of authority in facilitating the integration or synchronization of airspace operations, nor does it identify any key advisors assisting the commander in these decisions.

JP 3-09.3, *Close Air Support (CAS)*, defines some of the Air Force and Army relationships. It states that an Air Liaison Officer (ALO) is the senior member of the Tactical Air Control Party attached to a ground unit as the primary advisor to the ground commander on air operations. At the division and above, an ALO is an aeronautically rated officer with an intimate understanding of the capabilities and limitations of airpower. The latest version of JP 3-09.3 recommends that the ALO coordinates and integrates with only one activity of AC2, fires. JP 3-09.3 articulates the need for CAS training and proficiency to be able to "integrate all of the maneuver and fire support elements involved in executing CAS" (Joint Chiefs of Staff 2009, I-7). JP 3-09.3 addresses the need for a flexible C2 structure with a goal of "integration through the

balanced use of airspace and fire support coordination measures (FSCMs) so as to integrate and employ assets effectively with minimal delay in the support provided to ground forces" (Joint Chiefs of Staff 2009, I-8).

JP 3-30, *Command and Control of Joint Air Operations*, was updated January 2010 and its focus still remains on the overall C2 processes for joint operations. This document is important because it provides the structure and purpose of the Combined or Joint Air and Space Operations Center (C/JAOC). The doctrine highlights that "joint air operations are normally conducted using centralized control" which ensures a single commander for the "planning, directing, and coordinating a military operation or group/category of operations" (Joint Chiefs of Staff 2010, I-3). Centralized control provides coherent guidance and direction to ensure the joint force commander's objectives are achieved. This latest revision of JP 3-30 is the only doctrine that closely resembles the current AC2 structure at the corps level in Iraq.

The 2010 revision of JP 3-30 captures the Joint Forces Air Component Commander's (JFACC) ability to:

> establish one or more joint air component coordination elements (JACCEs) with other commanders' headquarters to better integrate joint air operations with their operations. When established, the JACCE is a component level liaison that serves as the direct representative of the JFACC. A JACCE is normally made up of the liaison element(s) of the Service designated to provide the JFACC. The JACCE does not perform any C2 functions and the JACCE director does not have command authority over any air forces. (Joint Chiefs of Staff 2010, II-15)

The JACCE is responsible for facilitating the integration of joint air power. It states that the JACCE expertise should be well-rounded with regard to the JFACC's guidance and requirements, joint plans, "operations, ISR, space, airspace management, air mobility, and administrative and communications support" (Joint Chiefs of Staff 2010, II-15).

JP 3-30 is one of the only publications to address unmanned aircraft system considerations. Most poignantly, it states that UAS "should be treated similarly to manned systems" (Joint Chiefs of Staff 2010, III-3). This guidance is poignant because the degree of training and experience an UAS operator receives could be as minimal as a two week certification course versus a minimum of a year's training for a manned system. JP 3-30 also highlights that UAS's are not always included on the Air Tasking Order (ATO) or in the Airspace Control Order (ACO) published by the CAOC. This is another area of contradiction as the publication also states that the ATO and ACO should be as thorough as possible, including all airspace users and applicable airspace coordinating measures. The Multi National Corps-Iraq AC2 section ensured that the airspace coordinating measures for the UAS's operations were added to the ACO prior to disseminating the ACO to all subordinate commands.

JP 3-52, Joint Doctrine for Airspace Control in the Combat Zone, discusses the methods of airspace control invoked by the JFACC, through the Airspace Control Plan (ACP): positive, procedural or a combination of the two control methods. As the doctrine highlights, AC2 cells generally do not 'control' airspace below the coordinating altitude but rather manage it through procedural control measures. The coordinating altitude is a common joint airspace coordinating measure defined as a procedural airspace control method "used to separate fixed- and rotary-wing aircraft by determining an altitude below which fixed-wing aircraft normally will not fly" (Joint Chiefs of Staff 2004, C-B-12). JP 3-52 defines procedural control as "a method of airspace control which relies on a combination of previously agreed and promulgated orders and procedures" (Joint Chiefs of Staff 2004, GL17). Procedural control doctrinally relies on the use of and adherence to

standardized graphic control measures. Conversely, positive control requires the positive identification, tracking, and direction of aircraft via digital data links. Radars and other sensors are extensively used to acquire, maintain, and monitor airborne assets.

JP 3-52 describes general airspace control authority responsibilities. However, it does not give airspace control managers any actual authority nor does it prescribe or offer examples of how to conduct any of the tasks it prescribes. In particular, JP 3-52 does not suggest how to construct a theater AC2 structure or how to conduct AC2 functions and activities throughout the different phases of a military operation. JP 3-52 simply defaults to JP 3-30 and summarizes the airspace control responsibilities in figure 3 but does not elaborate upon how to execute these responsibilities, especially when the ACA delegates his authority to lower levels.

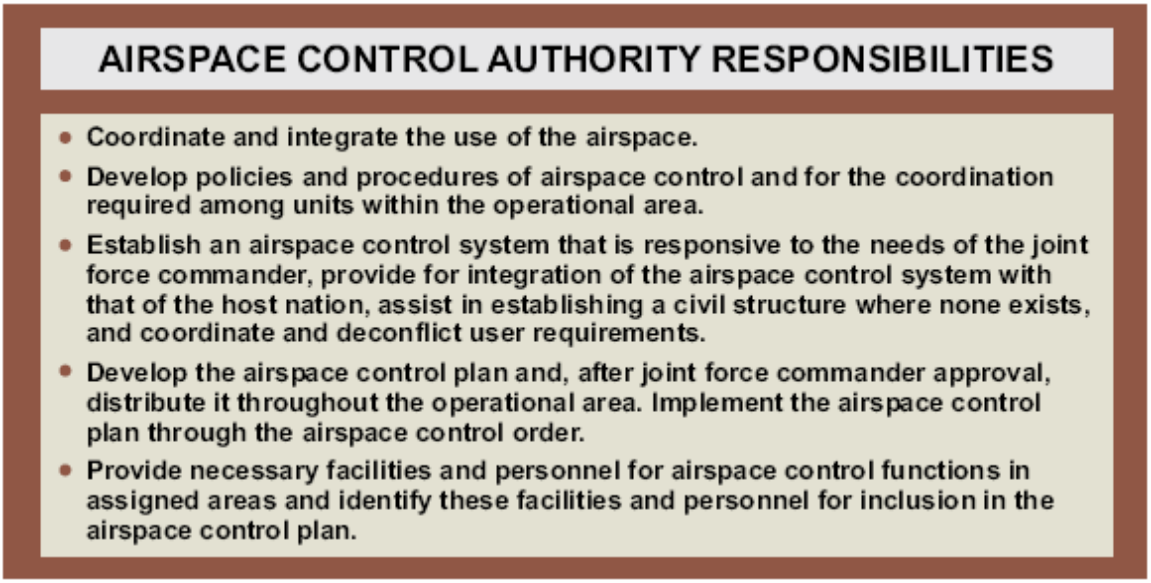

Figure 3. Airspace Control Authority Responsibilities
Source: Chairman, Joint Chiefs of Staff, Joint Publication 3-52, *Joint Doctrine Airspace Control in the Combat Zone* (Washington, DC: GPO, 2004), II-3.

Service Doctrine

Department of the Army, FM 3-52, *Army AC2 in a Combat Zone,* is the capstone of AC2. FM 3-52 provides general guidance on how to integrate, coordinate, synchronize, and regulate the Army's use of airspace. FM 3-52 also highlights the Army's insufficient inventory of assets required to allow the Army to control the airspace over the operational environment. The Army is forced to rely heavily on procedural control to deconflict air operations. However, the Army often lacks the ability to see or talk to all airspace users per the criteria to provide positive control (real time airspace coordination). FM 3-52 does not elaborate describe how to perform the alternate form of control, procedural, or how to disseminate procedural control methods to all airspace users in a timely manner.

FM 3-52 introduces the common reference system which provides "a universal perspective with which to define specific areas of the battle space, enabling commanders to efficiently coordinate, deconflict, and synchronize surface attacks. These systems result in rapid, deconflicted surface attacks; enhanced probability of mission success; and reduced potential for duplicated effort and fratricide" (Headquarters, Department of the Army 2002, 4-12). The problem with common reference systems is that the system must be agreed upon, accessible, and used by all airspace users (i.e. joint, multinational, civil, etc.) utilizing an area in order for the reference system to be effective.

Department of the Army, FM 3-52.1, *Multi-Service Tactics, Techniques, and Procedures for Airspace Control*, is focused on synchronizing airspace control roles and

responsibilities at the tactical level when more than one service shares the airspace, specifically the Army and Air Force. FM 3-52.1 shifts the focus of historical AC2 from deconfliction to integration and synchronization. FM 3-52.1 underpins the ACA responsibility of establishing an airspace control system (ACS) that is "responsive to the JFC and integrated with the host nation. The ACS is an arrangement of those organizations, personnel, policies, procedures, and facilities required to perform airspace control functions" (Headquarters, Department of the Army 2009, 2). FM 3-52.1 emphasizes the need for a responsive system able to provide a timely exchange of information via an interoperable communications network. FM 3-52.1 does not state how to establish a responsive ACS in lieu of specified guidance from the ACA or how to facilitate timely exchanges with the lack of interoperable equipment amongst the services.

FM 3-52.1 highlights a key difference in the joint publications definition of the coordinating altitude versus how OIF and OEF operations use the term, coordinating altitude, as the "vertical limit between airspace controlling agencies [i.e., the top of Army controlled airspace and the bottom of control and reporting center (CRC) controlled airspace]" (Headquarters, Department of the Army 2009, 2). FM 3-52.1 makes note of the difficulty in prioritizing airspace based off the JFC objectives when there are multiple supported commanders. The key take-away from the manual is that planners must incorporate airspace requirements from the initial stages when planning joint air operations to best facilitate seamless integration.

Department of the Army, FM 3-52.2, *Multi-Service Tactics, Techniques, and Procedures for the Theater Air Ground System (TAGS)*, is a critical publication with

regard to illustrating the AC2 organization. FM 3-52.2 provides a generic description of the decision processes, concerns, and procedures of the TAGS at the operational and tactical level. The Air Land and Sea Application manual was signed by all the services except for the U.S. Marine Corps. All the other services propose to incorporate the directives. FM 3-52.2 defines the role of the JFACC as the ACA and expound upon the ACA's authority over the TAGS.

FM 3-52.2 states that the JFACC is the ACA unless the JTF designates another commander to assume responsibility of the airspace. FM 3-52.2 highlights that all procedures published in the ACP are "subject to the authority and approval of the JFC" and the ACA has "coordinating authority only" (Headquarters, Department of the Army 2007, I-3). Despite this statement, FM 3-52.2 goes on to contradict itself by stating the JFC establishes the authority, command relationship, and responsibilities of the JFACC which typically includes tactical control.

The manual references the ACA responsibilities highlighted in figure 3, but does not elaborate upon how to accomplish these tasks besides in the stovepipe service hierarchical chain. It makes no mention of interservice communication at the same echelon or horizontal communications. The manual further states that the "centralized direction by the ACA does not imply assumption of OPCON/TACON over any air assets." (Headquarters, Department of the Army 2007, I-3). This statement is of epic proportions as it essentially reiterates that the ACA has no command or control authority of airspace users yet is expected to regulate the ACP.

Air Force Doctrine Document (AFDD) 2-1.7, *Airspace Control in the Combat Zone*, further expounds upon JP 3-30. It states that "centralized tasking and allocation of

resources is accompanied by progressive decentralization of task execution to the lowest command echelon capable. In centralized control, authority may be progressively delegated to subordinate echelons" (Headquarters, Department of the Air Force 2010, 20). AFDD 2-1.7 suggests that control should be delegated to the lowest echelon possible. It hints at this when the doctrine states that each component commander within a joint force, "Provides airspace control in areas designated by the ACA in accordance with directives and/or procedures in the ACP, and is prepared to provide airspace control in other areas designated by the ACA when combat or other factors degrade the airspace control system" (Headquarters, Department of the Air Force 2010, 7). However, the Army currently does not have the same capability to provide both positive and procedural control as do the Air Force, Marine Corps, and Navy.

Air Force Doctrine Document (AFDD) 2-1.3, *Counterland Operations,* speaks directly to Air Force's reluctance to integrate itself with ground operations as the Air Force views their operations "conducted at such distance from friendly forces that detailed integration with those forces is not required" (Headquarters, Department of the Army 2006a, viii). This statement speaks to the root of the problem. Rather than thinking in a truly '*joint*' or in a combined arms mode, the Air Force and Army often segregate operations rather than plan and execute all operations with an integrated mindset as do the Marine Corps.

The Marine Corps Warfighting Publication (MCWP) 3-25.3, *Control of Aircraft and Missiles (Marine Corps Airspace Control),* discusses the need for unity of effort similar to JP 3-52 and FM 3-52 in order to control airspace successfully. MCWP 3-25.3 emphasizes the need to integrate people, information, and the command and control

element and then “disseminate common situation awareness” (Headquarters, United States Marine Corps 1997, 4). The publication highlights how the Marines have adopted the principle of centralized command and decentralized execution which optimizes “the flexibility, versatility, and responsiveness of aviation by allowing control of his [aviation combat element commander] assets to be conducted by agencies both responsive to him and in touch with the dynamic changes to the battle” (Headquarters, United States Marine Corps 1997, 17). MCWP 3-25.3 also makes note of how the Marine philosophy differs from the Air Force and Army.

MCWP 3-25.3 introduces two different types of control: air direction and air control. “Air direction is the authority to regulate the employment of air resources including both aircraft and surface-to-air weapons to maintain a balance between their availability and the priorities assigned for their use” Headquarters, United States Marine Corps 1997, 26). Some tasks that encompass air direction include the creation of the air tasking order, changing scheduled missions, and tracking mission statuses. “Air control is the authority to direct the physical maneuver of aircraft in flight or to direct an aircraft or surface-to-air weapon unit to engage a specific target” (Headquarters, United States Marine Corps 1997, 27). Air control tasks include airspace management and airspace control. Although the Marine publication is over ten years old, its tenets are still applicable today as the Marine air command and control system remains flexible and tailorable. The Marine Corps’ modular structure is scalable and adaptable to an array of military operations. (See figure 4).

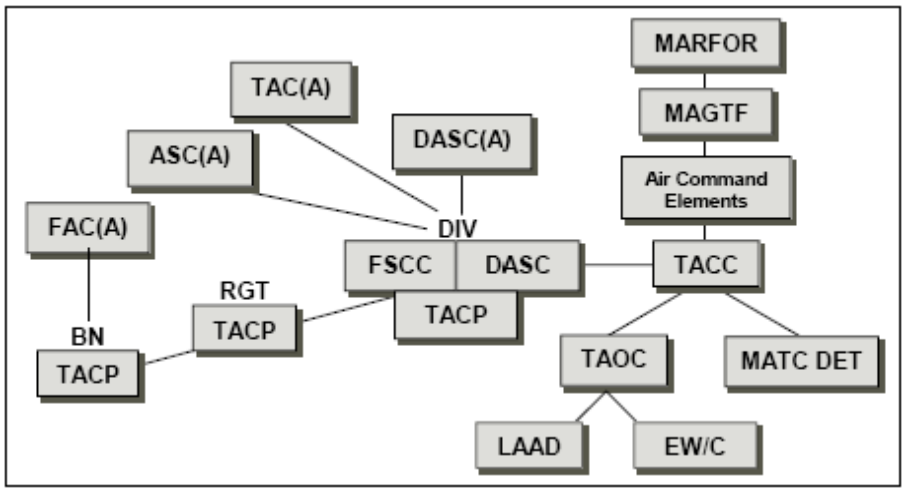

Figure 4. Marine Corps Airspace Control System

Source: Headquarters, Department of the Army, Field Manual (FM) 3-52, *Army AC2 in a Combat Zone* (Washington, DC: August 2002), 1-13.

Other Published Literature

The CALL Handbook 05-25, *Leaders Guide to A2C2 at Brigade and Below,* was once the bible for airspace management. The CTC's mentored rotational units on the tactical application of the techniques and procedures it cited as combat proven options. The handbook was one of the first documents that provided actual examples and gave recommendations on how to manage airspace effectively in a combat environment. CALL 05-25 highlighted tactics, techniques, and procedures (TTP) at brigade and below. CALL 05-25 did not prescribe or suggest TTP for echelons above the brigade. It also did not provide recommendations on how to facilitate better horizontal communication among the AC2 activities or how to facilitate better vertical communication in the TAGS hierarchy.

The CALL website provides several For Official Use Only publications that capture feedback, training trends and observations, insights, and lessons learned from

commanders and staffs in theater, and just after redeployment. Additionally, the CALL website provides quarterly training trends from the CTCs that echo many of the same sentiments from theater. In particular, the biggest concerns voiced and trends captured are with respect to doctrine. The concerns highlight the lack of a defined AC2 system, with a lack of defined roles and responsibilities, and the lack of a C2 authority or guidance to facilitate integration of vital AC2 activities (Center for Army Lessons Learned 2008). There are also organizational and training concerns that stem from the lack of an authority that facilitates AC2 activities with a staff often inadequately trained in their AC2 activity, let alone in joint operations.

The *FY2009-2034 Unmanned Systems Integrated Roadmap* looks to provide guidance throughout the Office of the Secretary of Defense by establishing certain goals. The three goals that best relate to reducing the amount of assets congesting the airspace and increasing the UAS effectiveness and facilitate better AC2 overall are:

> Goal 4. Achieve greater interoperability among system controls, communications, data products, data links, and payloads/mission equipment packages on unmanned systems;
>
> Goal 5. Foster the development and practice of policies, standards, and procedures that enable safe and effective operations between manned and unmanned systems; and
>
> Goal 6. Implement standardized and protected positive control measures for unmanned systems and their associated armament (Department of Defense 2009, 35).

As the roadmap alludes to, there are no standardized control measures for unmanned systems. The roadmap states that control measures and procedures are left up to the discretion of the airspace managers in the operator's chain of command to approve, disseminate, and enforce.

Raymond T. Odierno, Nichoel E. Brooks, and Francesco P. Mastracchio published “ISR Evolution in the Iraqi Theater,” in the *Joint Force Quarterly.* The article examined airspace issues in both Iraq and Afghanistan in the fall of 2006 to determine if gaps existed in doctrine to deal with the emerging airspace issues or if there were insufficient TTP provided by the OIF and OEF AC2 Collection and Analysis Team. GEN Odierno, in his capacity as the commander of Multi-National Corps-Iraq in 2007 and then later as the current Multi-National Forces-Iraq, stated that the current ability of conventional forces needed to be more “SOF-like” in the war in Iraq and insisted that airspace users, specifically UAS, be centralized under the corps commander. He further expounded upon the decentralized nature of the COIN environment and how it is imperative to decentralize most assets down to the lowest possible echelon. He stated that the “Corps level is where these decisions are best made because a higher or more distant command and control node cannot act quickly enough or with sufficient insight into the implications of its decision making process” (Odierno 2008, 51).

The Air Force Chief of Staff, General T. Michael Moseley, signed the “United States Air Force Air Support Operations Center Enabling Concept” on 1 June 2006 as a result of lessons learned from Operations Enduring Freedom and Iraqi Freedom. General Moseley outlined “the mission, functions and responsibilities of the air support operations center (ASOC)” (Headquarters, Department of the Air Force 2006b, iv). The Air Force directive attempted to integrate the ASOC with the Air and Space Operations Center (AOC) to increase the response time of air and space requests.

The directive stated that the “ASOC must effectively command and control combat air and space power at the time and place needed to achieve land and air

component commander's objectives" (Headquarters, Department of the Air Force 2006b, iv). The ASOC Enabling Concept addressed the need for joint training, the appropriate equipment required to integrate the joint air command and control system fully, and the inclusion of air battle managers as a career field. One of the most poignant statements in ASOC Enabling Concept was that "as a result from lessons learned during combat operations in Afghanistan and Iraq (2001-2005), the imperative to build C2 structures has highlighted both doctrinal and technical air/ground integration issues. The key concept will be to enhance the joint collaborative efforts to integrate rather than just deconflict joint assets" (Headquarters, Department of the Air Force 2006b, iv). This statement was crucial motivation for the development of the Joint Air Ground Integration Cell (JAGIC) discussed later in the organizational research.

The ASOC directive also designated that air battle managers are career fields in the Air Force for personnel trained in airspace control and management. Air battle managers operate airborne C2 aircraft and ASOCs. The Army does not have a career field specific for airspace managers nor is training mandated or required of any airspace manager.

One of the greatest complexities cited in airspace management is the proliferation of UAS. The Government Accountability Office Report, *Unmanned Aircraft Systems-Advance Coordination and Increased Visibility Needed to Optimize Capabilities*, published July 2007, reveals many interoperability issues of UAS. The report describes where one UAS cannot communicate to other UASs or command networks. It also cites the lack of a strategic plan to guide UAS development and investment. Interoperability issues, the inability of a UAS C2 system to be identified, or the inability of UAS to

communicate with other users in an AC2 element greatly exacerbates the AC2 system and its abilities (Government Accountability Office 2007).

Captain Daniel C. Duquette, head of the U.S. Navy Air Warfare Division's UAS Office, stated "integration [of UAS] is one of the major challenges still facing the military" specifically with regard to UAS (Roth 2007). Captain Duquette states the issue is not necessarily technology based but that the problem lies in the interoperability of service equipment. The interoperability issues lies with both the platforms and the ability of ACS personnel to see and talk to the platforms.

General Buchanan, former Combined Forces Air Component Commander for U.S. Central Command, views the problems with managing the congestion over the battlespace as a problem with technology. General Buchanan states the solution is simply to find a technological solution to decrease the congestion over the operational environment. By improving the UAS capability in order to reduce the number required to fly over the operational environment at one time. General Buchanan states that the "answer is not one UAV per soldier, but delivering the effect of one per soldier" (Roth 2007). Interoperability is one of the fundamental problems of AC2, as equipment interoperability causes a literal inability of assets to communicate. If most of the services' assets would or could communicate with one another and their respective AC2 systems, it would cut down on the number of simultaneous airborne platforms. This would greatly streamline the number of assets airborne at a once, but also drastically increase the efficiency and situational understanding of the AC2 systems and improve operations across all of the services, at all levels.

The most relevant RAND product to this thesis is a monograph sponsored by BG Steven Mundt, G3/5/7, Director of Aviation, during the 2007-2008 fiscal year, entitled *Army Considerations in Airspace Management.* The monograph makes recommendations to the current airspace structure. The report cites several recommendations made to the senior military staff. The monograph stems from a project titled, "Airspace Management: Harmonizing Manned and Unmanned System Operations," whose objective was to develop and examine airspace management options in order to provide integrated AC2 facilitating the optimal utility of airspace users. The monograph provides five alternative airspace options in addition to making recommendations to the Army for improving its AC2 system discussed in the organization review (Pernin 2009).

First, the monograph recommends that the Army should pursue clear goals in concert with the Air Force as to whether the Army wants to adjust AC2 systems to own the airspace above the brigade and division or as systems become more heterogeneous. It states the Army partner with and advocate a '*joint*' AC2 to manage joint airspace. The second recommendation the monograph makes is not to pursue a single solution but instead consider an adaptable system whose equipment can easily be upgraded and whose practices are flexible. This recommendation highlights the lacking measures of performance and guidance provided to all AC2 stakeholders articulating clear roles and responsibilities. Another critical point the discussion evokes is that the AC2 solution should capture and articulate issues at varying levels of theater, of the Army, of proponency, and user specific issues and concerns. The third recommendation the monograph makes is to plan and train AC2 under realistic conditions of high demand. The discussion revolves around the final recommendation affirms that most homestation

brigade or higher exercises do not have the resources to train sustained AC2 operations realistically or simulate the diversely saturated airspace (Pernin 2009).

The RAND monograph also acknowledges the JUONS originating with the Multi-National Corps-Iraq AC2 Section both in 2005 and again in late 2007. The JUONS highlights the AC2 concerns of the Multi-National Corps-Iraq (MNC-I) Command and subordinate commands with regard to airspace management. The MNC-I Command expressed grave concern over the extreme congestion of the environment below the coordinating altitude and the inability to identify all assets. This concern was continually expressed at annual MNC-I C3 Air Conferences for four consecutive years and echoed by the MNC-I Commander. The JUONS was submitted to the Department of the Army G3/5/7 for approval, originally in 2005. The JUONS was not officially approved for funding until April 2008. The researcher validated this information from her involvement with the JUONS, as of April 2009 no projects were formally implemented in theater to improve the situation.

A solution that could have assisted with the concerns expressed in the JUONS was capture in the 2007 Army Modernization Plan. The plan specifically addresses "replacing obsolete air-traffic services equipment and maintaining compliance with future airspace usage requirements" in addition to "ensuring digital interoperability for effective Joint/combined force operations" (Headquarters, Department of the Army 2006b, 73). Official follow up as to how or when exactly these efforts were or would be funded or implemented is not available.

The Joint Airspace Command and Control conducted a joint test in late 2006 with the Army under the support of the Office of the Secretary of Defense, Director,

Operational Test and Evaluation. The test evaluated the effectiveness of the current joint AC2 process when immediate mission requirements were received in support of forward operating bases and maneuvering elements. Their extensive testing stated that the joint AC2 process was “ineffective in supporting immediate missions generated in support of forward operating bases and maneuver elements” (Joint Airspace Command and Control Joint Test 2008, 3).

Organization

This portion of the literature review examines the organizational AC2 structure beginning with an overview of the TAGS and the service’s subcomponents. The review also highlights equipment common to the AC2 structures that facilitate the efficiency or airspace management. The doctrinal joint airspace management system is known as the TAGS (Joint Chiefs of Staff 2010, II-9). Additionally, the literature review examines conceptual organizations. The Rand monograph, “Army Airspace Considerations for Airspace Management,” develops and examines four ACS models. An explanation of the JAGIC is also provided. The JAGIC is a conceptual model created though an U.S Army and U.S. Air Force approach to integrating air-ground C2 for the division level. The proposed airspace structure integrates the ASOC and various Army warfighting cells. The organizations discussed in the following portion will provide the foundation for the analysis and recommendation of an organizational structure in chapters four and five respectively.

Theater Air Ground System

The TAGS is doctrinally founded and combines each service's AC2 system. TAGS is comprised of the different service airspace management systems: the Air Force's Theater Air Control System (TACS), the Marine Air Command and Control System, the Navy Tactical Air Control System, and the Army Air-Ground System that support the JFC. The TAGS integrates the AC2 systems and provides the framework for each service's airspace system to exist jointly in support of the JFC (Joint Chiefs of Staff 2010, II-9). See figure 5, the Theater Air Ground System Diagram to compliment the explanation of each major AC2 organization within the TAGS.

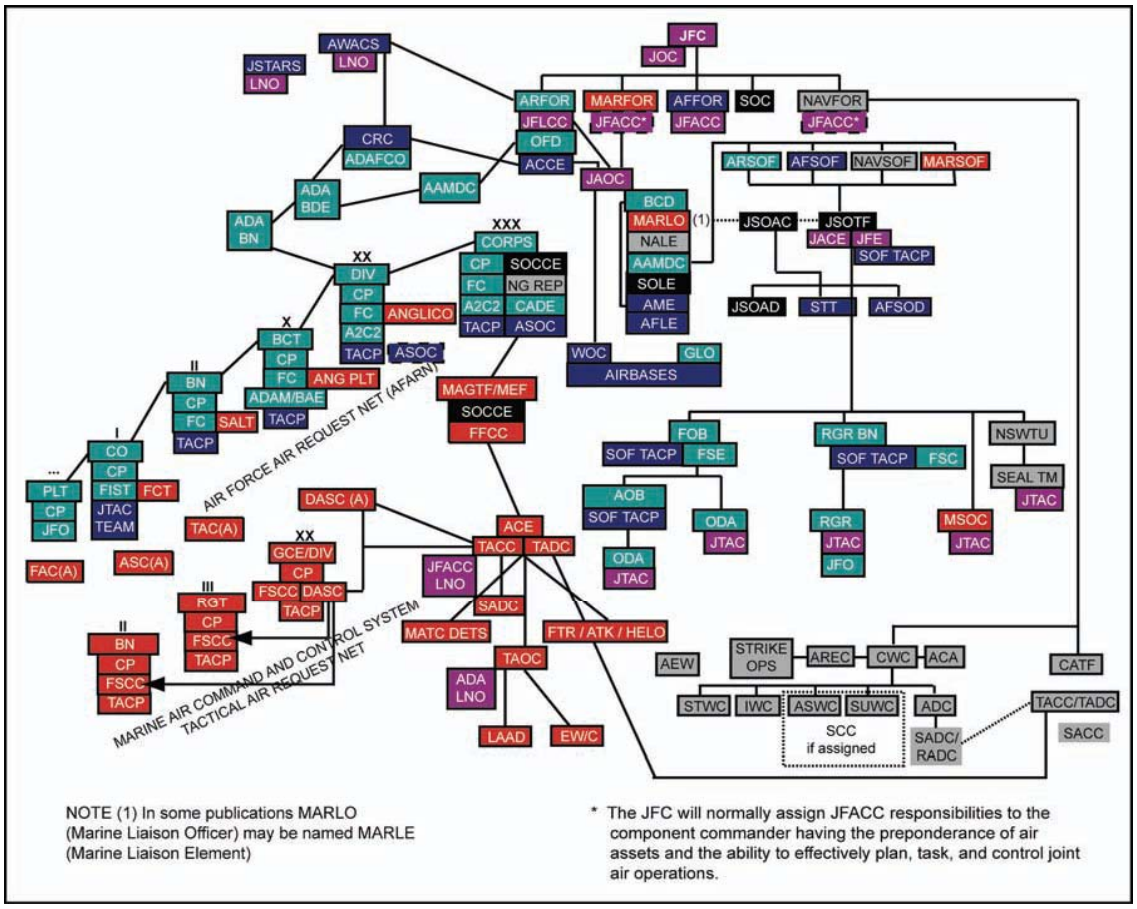

Figure 5. Integrated Theater Air-Ground System Diagram
Source: Headquarters, Department of the Army, Field Manual FM) 3-52.2, *Multiservice Tactics, Techniques, and Procedures for the Theater Air ground System (TAGS)* (Washington, DC: GPO, April 2007), B-1.

U.S. Air Force TACS

The JFACC usually operates from a Combined or Joint Air and Space Operations Center (C/JAOC). The JAOC is the hub of the TAGS. The U.S. Air Force TACS is comprised of the C/JAOC, the senior AC2 element of the TAGS. The JAOC provides command and control of all air operations. The airspace function in the JAOC works as a specialty team in both the combat plans and combat operations sections of the JAOC. The

JAOC is divided into five divisions that facilitate the ACA's responsibilities: strategy, combat plans, combat operations, air mobility, and ISR. One of the key tasks of the strategy division is developing the air operations directive which prioritizes all airspace operations based upon the JFC's guidance. The combat plans division builds the ACP, ATO, and ACO. The combat operations division manages the execution of and implements immediate updates to the ATO and ACO. The air mobility division coordinates with combat plans and operations to ensure air mobility assets are included in and managed on the ATO. The ISR division performs similar functions of the air mobility division but with respect to ISR assets (Joint Chiefs of Staff 2010, II-3).

Additionally, the JAOC is staffed by members of all the participating service components: Battlefield Coordination Detachment, Army Air and Missile Defense Command liaison team, naval and amphibious liaison element, Air Force liaison element, Special Operations liaison element, Marine liaison officer. The service liaisons are critical to the JFACC maintaining situational awareness of airspace operations and coordinating service requests or requirements. The ACA utilizes the TAGS via the liaisons to disseminate procedures. The component liaisons work for their respective component commanders and serve as conduits between the JFACC and their respective commanders. According to JP 3-30, component liaisons "must be equipped and authorized to communicate directly with their respective component commander" (Joint Chiefs of Staff 2010, II-21). This coordination is further complicated with a JACCE in OIF who is supposed to facilitate coordination with the component commanders or the JFC.

As the JAOC is responsible for three theaters and cannot be collocated with the JFC for an ideal C2 relationship, the JACCE is supposed to "bridge the physical separation" (Joint Chiefs of Staff 2010, H-2). The use of the JACCE is contradictory to the explanation of the component liaisons provided in JP 3-30 and seems to complicate issues since the JACCE "does not have command authority over any air forces" and appears to be no different than a component liaison (Joint Chiefs of Staff 2010, II-15). The JACCE has essentially the same responsibilities as the component liaison but the JACCE has much more rank.

Air Support Operations Center (ASOC)

The ASOC is the principle decentralized command and control node in the ground battle. It plans, requests coordinates, integrates, and conducts command and control of air and space power. "The ASOC's primary mission is to provide direction and control of air operations directly supporting Army ground forces" (Joint Chiefs of Staff 2010, xiii). According to JP 3-30, the ASOC normally collocates with senior Army fire support coordination center. This was not the case in OEF at the Corps level during 2007-2009. The ALO typically did most of the coordination with the senior fires cell and the ASOC separately.

Control and Reporting Center (CRC)

The CRC is a deployable, ground-based, command and control battle management platform employed at the tactical level in support of air operations planning and execution. The CRC supports the TAGS by contributing to an integrated air picture derived from its network of ground radars integrated with airborne, seaborne, and space-

based sensors. The CRC generally controls all the airspace users above the coordinating altitude through positive control methods (Headquarters, Department of the Army 2007, V-10).

U.S.Army Air-Ground System

The Army Air Ground System is the hierarchy of AC2 elements embedded at the corps down to the battalion level. The AC2 elements synchronize, coordinate, and integrate airspace users and warfighting functions at the echelon they are assigned. The doctrine previously cited states that the Army has AC2 elements from brigade through corps. However, doctrine only provides guidance for, regulates a specific organization of, and specifically assigns personnel to the Table of Organization and Equipment (TOE) at the brigade level. At echelons above brigade, there is no formalized AC2 structure or guidance on how the activities of AC2 are to interact.

As the Army and Air Force often work together in a joint operation, both elements should function as "a single entity in planning, coordinating, deconflicting, and integrating air support operations with Army ground operations" (Joint Chiefs of Staff 2010, xiii). When the TACS and Army Air-Ground System are operating as a single entity, the AC2 system is referred to as TACS-Army Air-Ground System. However, TACS-Army Air-Ground System is not a formalized AC2 system and doctrine does not direct a command and control relationship amongst the two elements. Instead, doctrinal references state that the AC2 element or liaison above their echelon coordinates the two service systems rather than formalizing a joint or modular structure at the corps and division.

Marine Air Command and Control System and
Navy Tactical Air Control System

The Marine Air Command and Control System consists of several C2 agencies that provide the Marine air-ground task force aviation combat element (ACE) with the ability to manage, supervise, and direct the "Marine aviation's six functions: anti-air warfare; offensive air support; assault support; electronic warfare; air reconnaissance; and, control of aircraft and missiles" (Joint Chiefs of Staff 2010, II-12). The Marine's senior C2 element is the Tactical Air Control Center that plans, produces and executes the ATO. When afloat, the Marine air ground task force is subordinate to the Navy's Tactical Air Control Center. The Navy Tactical Air Control Center is the principal air control system for amphibious air operations afloat. Once the Navy passes control of the aviation assets to the Marine Corps operations ashore, the Naval Tactical Air Control Center becomes subordinate. The Marine Tactical Air Control Center is the overarching AC2 system for exerting operational control over Marine aviation and air defense assets. The subordinate Marine AC2 element is the direct air support center whose principal responsibility is to control air operations in support of ground forces (Joint Chiefs of Staff 2010, II-12). The direct air support center is similar in function to the Air Force's ASOC, but deployed at the tactical level.

Non-doctrinal AC2 Systems and Concepts

The TAGS is an adequate stovepipe system that does not maximize the facilitation of the dissemination of information. However, TAGS is inadequate as it was not designed for the dissemination of information rapidly and real time coordination. The division and corps integration abilities and capabilities are critical as divisions and corps

generally have tactical control over assets. Nevertheless, the AC2 activities at the division and corps staffs are not currently organized or doctrinally required to integrate with each other, or the joint sections at the respective echelon. The RAND monograph on "Army Considerations in Airspace Management" developed the following four AC2 models to address these concerns.

The first model, Task Force (TF) Alpha, was based on the Air Defense Airspace Management or Brigade Aviation Element with elements from the S3 Air, Air Force Tactical Control Party and ALO. It found that TF Alpha's situational awareness relied heavily on the compliance and accurate reporting of airspace users in a procedural control environment. The second model, TF Beta, built upon TF Alpha by adding an ASOC and CRC. With the addition of the two Air Force elements, it included the addition of positive control; TF Beta managed diversity better than TF Alpha with seasoned Air Force controllers. The TF Gamma conceptual AC2 model deploys an Air Force CRC or an airborne C2 platform such as an Airborne Early Warning and Control System until the Army has time to set up an AC2 structure. TF Gamma's reliance on an aerial AC2 system scored it lower in its ability to provide persistent coverage but higher in its ability to provide a consolidated air picture resulting in greater situational understanding. TF Juliet utilized the current AC2 activities in a Joint Effects Integration Cell at the division level. TF Juliet scored the highest of the other three models because of the robust manning levels of each activity. TF Juliet's joint qualified controllers assisted with managing airspace operations in an organization that facilitated coordination amongst all the AC2 activities (Pernin 2009, xxiv-v).

The fifth conceptual AC2 model mentioned in the RAND monograph is the JAGIC, formerly called the JAGC2. The JAGIC is the result of the U.S Army and the U.S. Air Force formally collaborating on a solution to their service's Leadership with regard to integrating air-ground C2 for the division level. The proposed airspace structure integrates the ASOC and various Army warfighting cells to facilitate horizontal integration amongst the airspace activities and increase situational understanding. JAGIC is composed of existing joint and service organizations directing and monitoring coordination priorities with the division (Headquarters, Air Combat Command 2009). Figure 6 illustrates the difference between the legacy activities and the proposed airspace structure. The JAGIC is organized of existing resources, equipment, and manpower. The JAGIC is composed of existing USAF and Army AC2 activities and liaisons, the ASOC, and warfighting functional cells and element.

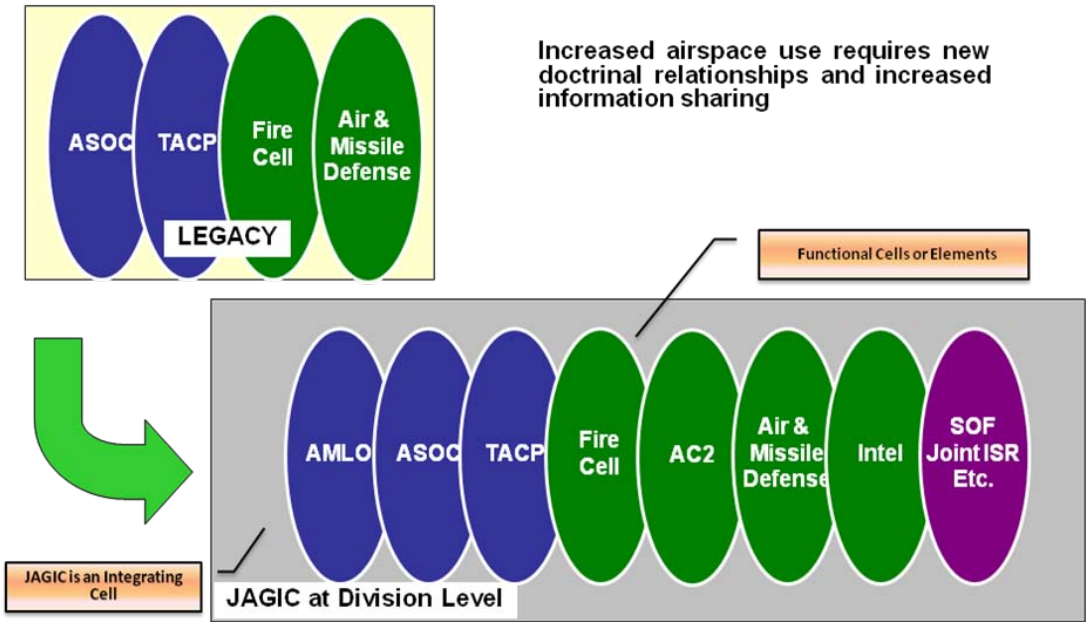

Figure 6. Enabling Real-Time Collaboration

Source: Headquarters Air Combat Command, *Joint Air Ground Integration Cell: A Concept for Joint Integrated Air-Ground C2 Operations (Rev 41.5)* (Washington, DC: GPO, 2009), 9.

Collaborative Air Planning Tools

Army Battle Command Systems (ABCS)

Within the AC2 systems are key ABCS that facilitate situational awareness. The ABCS is an automated system of systems designed to support unit operations and planning. An AC2 cell will doctrinally have a mixture of ABCS within their sections to provide the situational awareness to manage airspace. As currently configured, none of the ABCS are certified by the Air Traffic Services Command to positively control aircraft because of their inability to provide a consistent live feed or a near real time rate deemed acceptable by Air Traffic Services Command. The ABCS are approved to maintain situational awareness but not as the primary means to direct aircraft. The minimum ABCS in an AC2 cell are the Tactical Airspace Integrations System (TAIS), Air Defense System Integrator (ADSI), and the Air and Missile Defense Workstation (AMDWS).

Currently, ABCS communicate with joint systems, such as the Theater Battle Management Core Systems, through the Army's Publish and Subscribe Server. The Publish and Subscribe Server links ABCS, including the TAIS and the Advanced Field Artillery Tactical Data System (General Dynamics 2010). The TAIS transmits Airspace Control Measure Requests to the Theater Battle Management Core Systems (TBMCS) in the C/JAOC. The approved Airspace Control Measure Requests are passed to all the Service's ACS via the TBMCS. The TAIS receives the approved requests in an ACO which it parses to its system and is able to disseminate the ACO to lower echelons. Preplanned air support requests are shared between TBMCS and the Advanced Field

Artillery Tactical Data System through the Publish and Subscribe Server or via the TAIS. There is not an ability to exchange or access the databases between the Advanced Field Artillery Tactical Data System and Theater Battle Management Core Systems directly. Fixing this inefficiency would better provide the total operational context for deciding whether to attack a target and with what means. Operators have to currently decide on their own if they do not query the requestor for more information by another means as to how.

In particular, the TAIS is the Army's program of record for Airspace Planning and Management. Its software quickly identifies conflicts but the overall feedback of the system is that it is good for planning and overall management but not as good for flight following. The TAIS was initially approved in July 1995 as the materiel solution to the Army Airspace and Command and Control. It was created based on procedural control and thus its software is playing catch up in efforts to provide positive control. The TAIS has the ability to interface near real-time with Field Artillery ABCS and with the Combined Air and Operations Center's tool of record, the Theater Battle Management Core System (General Dynamics 2010). How the TAIS is actually employed is greatly dependant on the proficiency of the user and how the user is directed to use it.

The TAIS is able to receive and display real tracks via the ADSI. The ADSI is used to receive Tactical Digital Information Links from various airborne and ground sensors and radars which translate into air attacks that are then sent to and displayed in near-real time on the TAIS workstations. The ADSI is not a unique component to the TAIS shelter and has standalone capability. The ADSI is usually at the corps. There are

no standard network configurations mandated or suggested for producing the most effective consolidated operational picture.

Another system found in the airspace management cell is the AMDWS. The AMDWS is a collaborative operational, environment awareness information management system that contributes to combat effectiveness by retrieving, parsing, and disseminating time-sensitive information. AMDWS uses the data pulled from an array of air and ground sensors to provide a common operational picture. The AMDWS combines ground, air, and space-based sensor inputs and command and staff data with automated planning tools (General Dynamics 2010). AMDWS disseminates near real time information through digital air ground and system links. AMDWS displays near real-time air tracks and information, while supporting concurrent interaction with joint C2 networks, sensor sources, and ABCS systems. The AMDWS is one of many systems used to attain and provide situational awareness through a common operational picture throughout a command. (See figure 7).

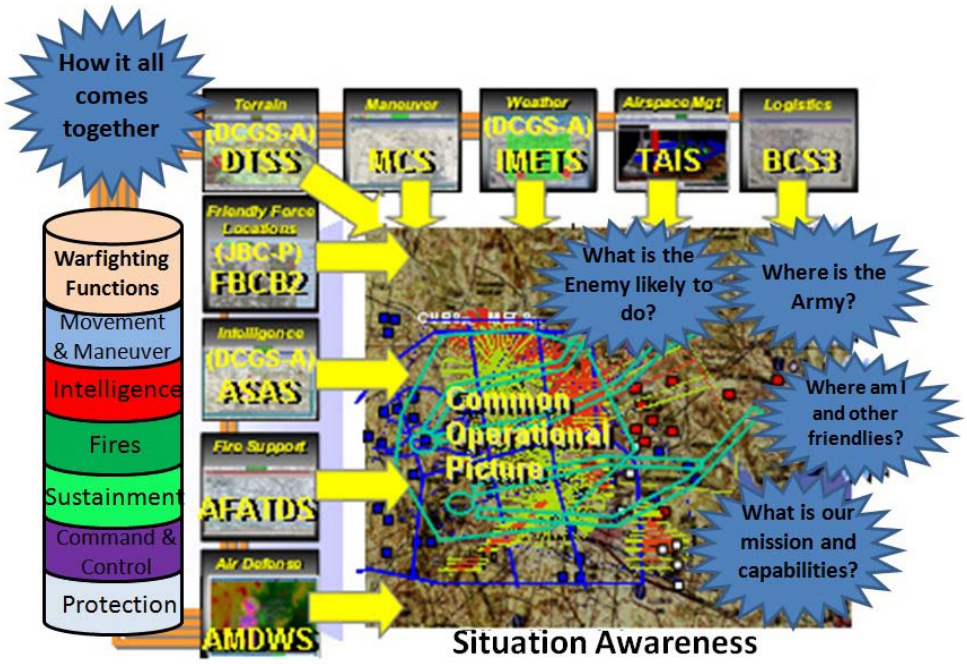

Figure 7. Situational Awareness

Source: James Kelton, *Airspace Management Below 3,000 Feet IS for OEF* (Huntsville, AL: GPO, 2009), 5.

There are several complexities in managing the airspace. Key to managing the airspace is maintaining a certain level of situational understanding which is easier to attain through a common operating picture as depicted in figure 7. Figure 8 further illustrates the complexities of the current ACS and how the TAIS aides in managing the complexities of air ground integration from the brigade to the corps level. The visualization figure 8 provides helps depict the disparity in the Service's ACS. The figure shows the seamless integrated airspace structure the Marine Corps has, combing positive and procedural control of multiple airspace operations, versus the Air Force and Army side divided by the coordinating altitude. Figure 8 also highlights the difference in planning and execution of all three Services.

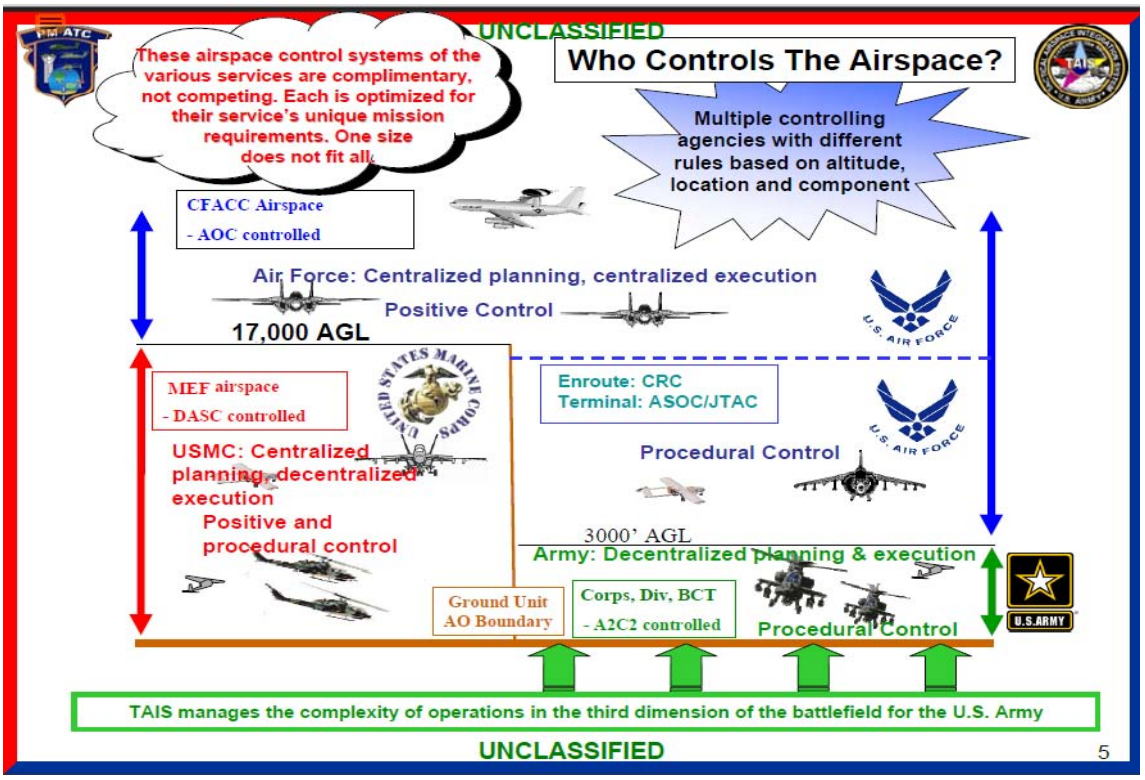

Figure 8. Airspace

Source: James Kelton, *Airspace Management Below 3,000 Feet IS for OEF* (Huntsville, AL: GPO, 2009), 7.

Department of Defense Education and Training

There are but a handful of Department of Defense schooling opportunities afforded to Service personnel to assist Servicemen with conducting AC2 from the tactical through the operational levels. At the tactical level, there is the Forward Air Controller Qualification Course, the Ground Liaison Officer Qualification Course, and the Joint Firepower Course. At the operational level, there is the Specialized Joint Aerospace Training and the Joint Air Tasking Order Processes Course available to Servicemen. Training Circular 1-400, the *Brigade Aviation Element Handbook*, is one of the only doctrinal references that provides recommended training for AC2. TC 1-400 explains that specific training for AC2 members is "under development," and in lieu of mandatory

training, at least one or more member of the section should attend “any or all of the recommended courses” (Headquarters, Department of the Army 2006, 1-4). These recommended courses are the:

1. Joint Fire Power Course, Nellis Air Force Base.

2. Joint Targeting School (6 weeks).

3. Joint Aerospace Command and Control Course.

4. Joint Personnel and Recovery Agency PR courses 101 and 301.

5. Joint Air Tasking Order Process Course (Headquarters, Department of the Army 2006, 1-4).

Figure 9 illustrates the spectrum of education available to AC2 personnel. The figure highlights the limited courses available at the respective echelons of AC2 and the general levels of military operations the ACS is responsible for. Figure 9 shows some of the available, but limited mobile training opportunities as well.

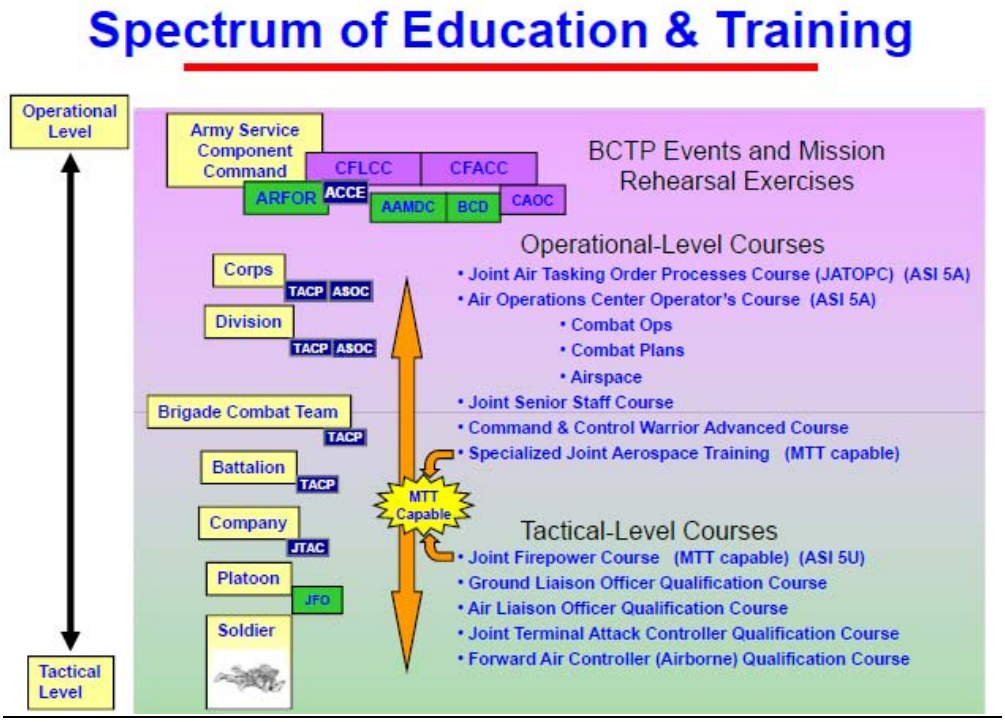

Figure 9. Spectrum of Education and Training

Source: U.S. Army Training and Doctrine Command, *Army Joint Support Team* (Hurlburt Field, FL: GPO, 2009), 12.

Summary of Literature Review

The literature review compared current literature to the AC2 structures employed over the past decade in support of OIF and OEF. The research began with a joint, then a Service review of overarching guidance that referenced the organization and training of the AC2 elements. It is notable that many of the multi-service manuals are missing the U.S. Marine Corps input and signatures which highlights the interservice friction that can result when all components do not participate in the process. Chapter 3 will elaborate upon the methodology used in analyzing the research findings.

CHAPTER 3

RESEARCH METHODOLOGY

A fair amount of literature exists on AC2, but not many publications provide explicit guidance on how to conduct AC2 or how to function effectively at echelons above brigade in a joint environment. The Joint, Army, and Air Force electronic publication sites were used extensively to acquire doctrine, regulations, manuals, and unclassified publications. Additionally, the U.S. Army Combined Arms Research Library in Fort Leavenworth, Kansas, provided several publications that dealt with AC2 directly or indirectly. The RAND Corporation's Project Air Force reports and Center for Army Lessons Learned were also utilized to extract observations and best practices captured by these agencies with regard to AC2. The study focused on application and gaps in doctrine, prescribed and ad hoc AC2 organizations, and training available or mandated to airspace users and AC2 sections (Pernin 2009).

The methodology used to accomplish this research began with a thorough doctrinal review. The study examined how doctrine and current organizations are emplaced to facilitate airspace management and airspace control issues. The review provided the foundation for the analysis and the study highlighted the military frame of reference for AC2 across the military Services. The research began with reviewing joint publications to note the definitions, doctrinal authority, and roles and responsibilities of AC2 sections, specifically at echelons above brigade. In reviewing multiple joint publications, it brought to bear some deficiencies in which the publication did not quite resemble the current AC2 structures employed in either OIF or OEF. Many of the latest

practices, techniques, and procedures were not captured yet in the doctrine even though some of the most recent doctrine on AC2 was published within the past 12 months.

Next, the research focused on specific Service doctrine in an effort to understand how Service doctrine mandated their respective Service AC2 sections to organize in facilitating airspace management and resolving airspace control issues. The review of Service doctrine examined and compared terminology defined in joint publications to highlight similarities and discrepancies. The review of Service manuals uncovered that there is no mandated or institutionalized training of AC2 at any level, nor, in some cases, is there a required level of proficiency airspace users to utilize the airspace (Headquarters, Department of the Army 2006, 1-4).

A review of other publications, specifically articles and Senate or House of Representatives testimonials published by former OIF and OEF commanders at various echelons provided great insight to the concerns commanders had and issues their organizations encountered. CALL and RAND manuals also provided poignant insights from theater outbriefs and interviews conducted by various command and staff members that highlighted and reinforced much of the analysis elaborated upon in chapter 4. These findings and analysis by OIF and OEF staffs and commanders assisted the researcher in providing answering the primary and secondary thesis questions, and recommendations in chapter 5.

The After Action Reviews produced by the Joint Readiness Training Center and National Training Center validated many of the findings and conclusions discussed in chapters 4 and 5. The CTCs captured observed trends and complexities in the current system with regard to AC2. The trends produced over the past five years at the CTCs

reinforced many of the findings produced in chapter 4 and 5 with regard to deficiencies in doctrine, organization, and training discrepancies. Many of the researcher's observations and experiences were also reflected in theater outbriefs and commander interviews conducted by the CALL. The Combined Arms Center Airspace Management Section contributed to the CALL website, describing concerns and highlighted airspace best practices and recommendations.

As a graduate of the Joint Firepower Course and the Joint Air Tasking Order Process Course, the researcher received institutional training on airspace in addition to 13 years of practical experience as an Army aviation officer. The researcher was charged with establishing, running, and managing the AC2 Section at the National Training Center from late 2004 through summer of 2009. Five years of hands on experience provided a unique opportunity to observe and supervise AC2 sections at many different echelons. The AC2 section at the National Training Center served as the rotational unit's division higher headquarters. The AC2 sections managed all live and virtual airspace operations, from UAS to rotary-wing and fixed wing aircraft, to fires to radar acquisition from surface to 60,000 feet Mean Sea Level (MSL) throughout the course of a rotation, real-time. While at the NTC, the researcher was charged with providing feedback to Aviation Tactical Operations sections, Brigade Aviation Elements, and Air Defense and Airspace Management sections, Fires and Effects Coordination Cells, the Task Force G3 Air, UAS operators, and unit Leaders. The overall responsibility and safety of all airspace operations was delegated to the researcher as the ACA. Over the course of the past five years and in the capacity of the year served as the Multi-National Corps-Iraq Airspace Director, the researcher provided feedback to CALL, Air Land Sea Application, Joint

Working Groups, and the Combined Arms Center Aviation and Airspace Division. The feedback the researcher provided resulted in draft publications and articles on airspace management. The researcher's first-hand experience provided a unique perspective to the study which assisted the researcher with highlighting deficiencies and providing recommendations.

Interaction with the Program Manager's office for the TAIS was made to acertain the most current updates to the TAIS, and future plans to improve the system's ability to further enhance airspace management. Informal contact was maintained with two of the former MNC-I AC2 Directors and former CTC observor controllers to serve as a sounding board and reaffirm observations. The researcher contacted the former Program Manager for UAS operations in Iraq and Afghanistan to determine and validate lessons learned from studies and reports he conducted. Much of the UAS Program Manager's feedback was captured in Government Accountability Office audits for the Senate or House of Representatives, and discussed in theater outbriefs.

Summary

There are several publications that exist on AC2, but only limited literature provides any guidance or reference on how to conduct AC2 or how to function effectively at echelons above brigade in a joint environment. After reviewing the AC2 structure proposed in doctrine with regard to organization and training, a thorough analysis, review and comparison of best practices and lessons learned is conducted in chapter 4. Chapter 4 answers the primary and secondary questions. Chapter 4 provides

the basis for the recommendations and improvements offered with respect to doctrine, organization and training to enhance the efficiency and functionality of AC2 in chapter 5.

CHAPTER 4

ANALYSIS

> We saw for the first time integration of forces, rather than deconfliction of forces. I believe perhaps most transformational is that particular notion--the business of the integration of forces, rather than, as we have seen in the past, simple deconfliction of forces.
>
> —Gen Tommy Franks
> *OIF testimony to the Senate Armed Services Committee*

The purpose of this research is to analyze the doctrine, organization, and training regulating AC2, and recommend ways to enhance joint integration of all operations over and within the ground commander's area of operations (AO). As a member of CALL from the Joint lessons learned team annotated, “Airspace is a finite resource, as the number of airspace users increases, AC2 elements run out of airspace” (Center for Army Lessons Learned 2006, 8). The proliferation of UAS and the sheer density of airspace operations compounded by civilian and multi-national airspace users greatly challenge the current AC2 system. There is not enough airspace to reserve and partition areas of airspace off for individual airspace users as the Army has historically done through the heavy reliance on deconfliction for conducting AC2 operations.

AC2 entails more than mere deconfliction of forces and operations, it should maximize combat effectiveness without unduly restricting operations through the integration and coordination of operations. The historical airspace partitioning method is not responsive enough and far too time consuming to support dynamic operations and immediate decision making. Any AC2 system must possess the capability to identify all airspace users rapidly and positively, and to integrate all airspace operations to maximize

each operation's effectiveness. In highlighting doctrinal and technical issues, the ASOC Enabling Concept states the key notion to integrated operations "will be to enhance the joint collaborative efforts to integrate rather than just deconflict joint" (Headquarters, Department of the Air Force 2006, iv). This chapter will analyze AC2 doctrine, organization, and training to answer the primary and secondary thesis questions of how to increase the effectiveness, efficiency, and the overall safety of airspace operations at echelons above the brigade level.

Doctrinal Analysis

The basic friction the Services face with coordinating operations is similar across the board. Over the past decade, the Armed Services shifted its focus and warfighting style from a conventional Cold War type of fight to full spectrum operations. However, the doctrine governing the airspace management has not evolved. TAGS and AAGS is still the doctrinal joint airspace structure utilized by the military to oversee air ground operations. Despite the evolution in warfare, there were very few modifications made to the doctrinal joint airspace structure, specifically the AC2 structure. In spite of the drastic changes to airspace that have occurred over the past decade, not many doctrinal updates or additional guidance was made to address the changes.

JP 3-30, *Command and Control of Joint Air Operations*, is one of the newest manuals published. JP 3-30 was published in January of 2010 and makes no modification to the TAGS or AAGs other than introducing the Joint Air Component Coordination Element (JACCE). The JACCE's purpose is to serve as the "direct representative of the JFACC" (Joint Chiefs of Staff 2010, xiv). The introduction of the new AC2 element is

one of the only doctrinal changes to the TAGS structure to date. The director of the JACCE serves as the JFACC's liaison in theater, but has no actual control over the aircraft. The Center for Army Lessons Learned Theater outbriefs revealed frustration with the TAG element rather than sentiments that the JACCE fulfilled its doctrinal intent "to better integrate joint air operations" with respective Service commanders (Joint Chiefs of Staff 2010, II-5).

From mid 2007 to the spring of 2009, the MNC-I AC2 and C3 Air Current Operations sections had minimal interaction with the JACCE with respect to current or daily operations. However, both the MNC-I AC2 and C3 Air sections had extensive interaction with the JACCE during future planning for operations that involved all the AC2 stakeholders. In particular, the JACCE often led and facilitated projects affecting the transition from military airspace control to civil authority and operations that enabled host nation AC2 capacity. With regards to the daily or current operations requiring immediate decision making or collaboration, the JACCE was not fully integrated into the process. However, the JACCE did facilitate the integration of AC2 operations requiring extensive collaboration with AC2 activities that included host nation and civil authorities (Center for Army Lessons Learned 2008).

The JACCE fell short of achieving the primary objective of maximizing the effectiveness of combat operations without undue restrictions and with minimal adverse impact on the capabilities of any Service airspace since the JACCE was just another liaison in the TAGS node. The JACCE did not have control over any airspace user. JP 3-30 states that "Only the JFC has the authority to reassign, redirect, or reallocate a component's air capabilities/forces" (Joint Chiefs of Staff 2010, ix).

Airspace control must not infringe on the authority vested in commanders to approve, disapprove, or deny combat operations. Airspace managers must also have an appropriate level of authority that allows AC2 systems to make quick decisions that enable streamline operations in tune with JFC guidance. There is no doctrinal publication that designates an authority or an AC2 system to facilitate horizontal component integration of airspace operations or AC2 systems.

Within a complex airspace environment such as OIF or OEF, the facilitation of situational understanding hinges on the use of common terms and procedures. Airspace processes utilized must be understood and adhered to by all of the airspace stakeholders. For example, all military component forces should adhere to guidance provided in the ACP, the ACO, and the ATO. However, multi-national partners and civilian airspace users comply with different airspace guidance. Civil airspace users comply with an Airspace Information Publication. The Airspace Information Publication requires coordination with other government agencies, intergovernmental organizations, nongovernmental organizations, and multinational or host nation forces to change or update the unclassified document.

The fact that all airspace users do not use the same airspace procedural guidance adds greater complexity to AC2. AC2 operators must be cognizant of what military operations conflict with the civilian procedures and what military procedures are releasable for civil publication. The only doctrinal guidance addressing the complex airspace's hindrance to military operations is in JP 3-30. JP 3-30 suggests that joint forces establish an airspace control structure as US forces have in OIF and OEF. No doctrinal publication provides any further guidance on how to conduct military operations during

Phase V, enabling civil authority. A US military objective during Phase V is to transfer airspace control to host nation civil authority, yet JP 3-30, the newest airspace doctrine, does not discusses how to incorporate all airspace users, especially into a civil airspace structure.

An additional disparity identified during the comparison of joint and service doctrine was the definition of terms. For example, FM 3-52.1 defines the coordinating altitude as the "vertical limit between airspace controlling agencies [i.e., the top of Army controlled airspace and the bottom of CRC controlled airspace]" (Headquarters, Department of the Army 2009, 2). However, joint publications do not delineate the type of control or distinguish between the Services' airspace and areas where other Services exercise authority in an area of responsibility. The definition of this one procedural airspace coordinating measure allows for assets to transition above or below the coordinating altitude while complying with the controlling agency of that particular airspace. Although, in accordance with joint publications, fixed-wing aircraft will not normally fly below the altitude and rotary-wing aircraft will not normally fly above it, the exception is becoming common practice (Joint Chiefs of Staff 2004).

The mere explanation of the term, coordinating altitude, as defined in doctrine is not reflective of operations being conducting in OIF and OEF. There are Army aviation assets at all attitudes and several Air Force missions that require assets to fly below the coordinating altitude for a period of time. The doctrinal definition of coordinating altitude illustrates the disparity between joint and service doctrine, and the fact that doctrine does not accurately reflect the application of the airspace coordinating measure.

Additionally, there currently exists no general or theater specific doctrine that clearly designates the joint command relationships, to include supporting and supported roles, and formalized AC2 structures. This discrepancy is one of the biggest points of concern expressed by MNC-I Senior Leaders. MNC-I Senior Leadership stated that the ad hoc structure did not provide the supporting and supported relationship capable of dynamically retasking air assets in support of the ground commander (Center for Army Lessons Learned 2008). Also, splitting the joint command structure with the Marines in Multi National Forces-West further disjointed command relationships as many of the Marines flew strictly in support of their own operations. The Marines rarely flew in support of or integrated with MNC-I operations unless specifically tasked in an Operational Order to do so. The frustration was felt by the MNC-I C3 Air Section and by Senior Leaders who would have liked to have a majority of Marine air under the same allocation and apportionment pool as all other air assets in theater (Center for Army Lessons Learned 2008).

Organizational Analysis

As the MNC-I Commander stated in the JUONS referenced throughout the thesis, "The joint community and the U.S. Army are not equipped to manage or adequately deconflict airspace of high-traffic density" (Center for Army Lessons Learned 2008, 1). There was and is no JFACC assigned to the MNF-I Commander. The JFACC is assigned to the Commander of US Central Command that has the responsibility of three theaters: the Horn of Africa, OEF and OIF. The lack of doctrinal guidance, untrained personnel, and inadequate equipment to monitor a plethora of assets and produce a common

operating picture to gain situational understanding have resulted in ad hoc AC2 organizations and extremely complexAC2 processes.

The typical ad hoc AC2 configuration at Division and Corps loosely resembles an Air Defense Airspace Management or Brigade Aviation Element with a greater span of responsibility. There is no regulation or guidance that mandates or even facilitates the inclusion and integration of the fire support coordinator, or liaisons from neither the Air Force nor any other Service component utilizing the airspace. There is no authority designated to any section or key personnel to specifically facilitate the communications or the integration of airspace operations. There is no standardized or institutionalized AC2 structure that mandates the collocation of airspace stakeholders either.

The key to conducting airspace management successfully is the ability to maintain situational awareness. Situational awareness and situational understanding are very dependent upon how compliant the airspace users are with respect to reporting accurately and adhering to published procedural control measures. Even if the AC2 section has its own organic radar capability or is able to utilize another Service's radar feed, the AC2 section's digital systems may not provide an accurate common operational picture. This is further complicated by platforms operating at low altitudes when line of site communication is intermittent or unreliable due to the terrain or physical obstacles. As most of the congestion occurs at low altitudes, line of sight generally poses a literal obstacle in blocking transmissions from the platforms to an AC2 section and vice versa that enable all airspace users to be tracked and identified with certainty. Even when high altitude aircraft are tasked to assist with data link relays, the reliance on the airborne assets is still not always a guaranteed fix to the line of sight obstructions. The airborne

asset providing digital relay may be redirected to other missions, may not be available or the data may be interoperable with another Service's equipment. As a result, the Army relies heavily on procedural control because of the Army's inability to perform positive control.

Another concern with ad hoc organizations is the ability for the organization to account for all the AC2 stakeholders. The overall airspace structure in OIF resulted in a separation of the Marine Forces in Multi-National Forces-West. This separation caused a strain on relations among all the Services and added an extra level of bureaucracy with respect to AC2. A more streamlined operation could be attained from a centralized command of all the airspace users. Furthermore, the Multi-National Forces-West liaisons within the Joint Operations Center often did not understand or could not rapidly assist with airspace concerns requiring immediate action because the liaisons did not have AC2 communication systems (Center for Army Lessons Learned 2008).

As the airspace grows increasingly more complex with multiple airspace users, the need for a responsive and flexible AC2 system to integrate the array of platforms will also grow. An integrated C2 organization creates shared awareness and enables collaborative discussions and decisions. Most importantly, it creates the optimal situational understanding among stakeholders in the AC2 system.

Training Analysis

Training trends observed over the past five years at the CTCs illustrated that rarely were there more than Air Force and Army involvement in a rotational exercise. The Air Force involvement was generally limited to an ALO, limited ASOC and CRC

oversight, and a few hours of coverage from live USAF platforms. The CTCs did a good job at trying to populate the battlefield with a multitude of virtual assets to replicate the lack of live assets and other Service involvement. As personally witnessed, rarely do Special Forces units or Marines integrate with Army rotational units. Additionally, during a one year training cycle, Special Forces and Marine Forces rarely participate in more than two training rotations a year due to a high operational tempo.

CTC training is considered a premiere training opportunity culminating a unit's training preparation for deployment. For many units, CTC training is one of the first exposures to a joint environment, and the joint training is generally limited to the Brigade Staff. A similar training capability that is mobile and caters to units at their homestation is the Battle Command Training Program (BCTP).

The research uncovered that most soldiers interviewed post deployment state there was a lack of joint training prior to deployment. Many Soldiers expressed a lack of understanding of other Service component structures and a desire to become more familiar with the other Services (Center for Army Lessons Learned 2008). The CTCs and BCTP promote an increased focus on air ground integration in order to promote habitual relationships and establish situational understanding of the supporting and supported entities. However, CTC and BCTP opportunities are limited to the deployment timeline of a unit.

BCTP is a mobile training team that replicates Joint-Interagency – Intergovernmental Multinational Operations scenarios for the brigade through the Joint Task Force level. BCTP supports division and corps exercises and conducts battle command seminars for divisions and corps. BCTP does not replicate or provide all the

live joint assets or role players the Army division and corps members would potentially collaborate or integrate operations with. BCTP relies heavily on simulations versus the live interaction the CTCs provide. Bottom line, joint training opportunities are limited. There is an overall lack of joint training opportunities available for the Armed Forces at the unit level, at the command level, and at the user level of both ground forces and airspace operators.

Another common trend observed from the CTCs and BCTP was that it generally took several days for a rotational unit to be fully operational with regard to digital connectivity, especially with the more joint feeds involved. Brigade Combat Team Headquarters have improved over the last five years from taking just over a week to an average of three days to display a common operational picture. Part of the problem is that there is rarely a standardized operating procedure, and doctrine does not address a standardized method to integrate all feeds in order to disseminate and assimilate the information throughout the command (Center for Army Lessons Learned 2009a).

An additional area that greatly lacks standardization is the training of UAS operators and UAS operations. UAS adds complexity to the airspace with the proliferation of UAS assets. Specifically, the Small Unmanned Aircraft System (SUAS) accounted for ninety percent of the UAS assets in both OIF and OEF, yet SUAS operators are only mandated to complete a two to three week certification course (Curtis 2010). Furthermore, SUAS operators retain their primary military occupational specialty and fly the SUAS as an additional duty.

SUAS operators are not assigned to a SUAS pure platoon with a SUAS platoon sergeant or platoon leader to ensure SUAS operators receive standardized training or

remain at an acceptable level of proficiency. Recent trends from OIF and OEF highlight the general lack of understanding UAS operators possess of the Aircrew Training Program which governs all rated crewmembers (Curtis 2010). Therefore, it is doubtful that the SUAS operators are aware of all, let alone internalize airspace policies, standards, and procedures to promote the safety and effectiveness of their operations after only a two week training course. The minimal training required of SUAS operators poses an obstacle in attaining the goals of standardization the *FY2009 Unmanned Systems Integrated Roadmap* strive to achieve. Moreover, there is no enforcement or oversight of the UAS operators to ensure proficiency, or compliance of airspace procedures.

Additionally, many of the SUAS platforms do not have the technology required to track or display their position. Coupling the inability to track the UAS platform with insufficient training and lack of a standardized program for the UAS operators and UAS operations is a volatile mix. As the AC2 director for the NTC for five years, the researcher observed that within a three week cycle, a rotational unit averaged five airspace procedural violations relating to UAS operations.

Answering the Thesis Questions

How can the functionality and organization of the AC2 at echelons above the brigade be improved to increase its effectiveness, efficiency, and the overall safety of airspace operations?

The effectiveness, efficiency, and the overall safety of airspace operations can be improved by implementing doctrinal, organizational, and training enhancements. The research and analysis highlighted many deficiencies with the current AC2 system. The

doctrine governing AC2 is not updated to reflect current practices. Doctrinal publications that describe the TAGS as the joint airspace structure have not been modified to increase the capabilities or the efficiencies of the ACS or airspace users despite changes to the operational environment. Doctrine does not mandate training of many of its AC2 stakeholders. As Chapter Five will discuss, a doctrinal revision is required. An organizational change that facilitates better communication and integration of all airspace stakeholders and standardized training will exponentially increase the effectiveness, efficiency, and the overall safety of airspace operations.

Secondary Research Questions

1. Should the Joint community implement a joint modular system that is flexible and scalable based on the operational environment?

Yes, as joint operations become the norm, the C2 organization and the AC2 structure should also be joint. A flexible and scalable organization is ideal to support the flexible operations of a modular Armed Force. The modular system would facilitate integration, collaboration between all AC2 stakeholders. A scalable and modular AC2 system would ensure that the appropriate level of personnel from the appropriate agencies were present within the system to maximize the effectiveness and efficiency of all operations.

2. Is the AC2 sections' authorized personnel strength at echelons above the brigade sufficient to conduct any operation in the realm of Full Spectrum Operations?

The Table of Organization and Equipment has sufficient personnel in authorized positions to perform AC2 in support of FSO. However, the authorized personnel

performing AC2 functions should be organized under a selected C2 authority in an integrated, modular section. Doctrine should designate an AC2 system or C2 authority to fully integrate and coordinate all consumers of the airspace over and within the ground commander's AO to increase the efficiency and effectiveness of air ground operations.

3. What doctrine and training is the US Army lacking with respect to AC2 and at what level is the doctrine and training lacking?

There is a lack of doctrine to reflect best practices, recommended TTPs or resembles the current AC2 structures employed in theater. As Chapter Five reiterates, FM 3-52 or JP 3-52 have not been revised since 2002 or 2004 respectively. JP 3-52 should clarify the disparity between service and joint publications of critical airspace positions, relationships, terms and procedures. There is currently no doctrine that provides specific guidance to AC2 structures below the JAOC even though the preponderance of operations and required coordination occurs at the division and brigade levels. Current doctrine promotes a rigid vertical management style that discourages lateral lines of responsibility and hinders communication between the Services. Doctrine should better encourage integration and designate a system or C2 authority to facilitate communications amongst all AC2 stakeholders. Furthermore, training to reinforce and institutionalize standardized terms and procedures should be mandated at all levels and integrated into all exercises and operations.

Summary

The research and analysis of AC2 doctrine, AC2 organizational systems, and AC2 training repeat the sentiments of numerous lessons learned which describe inefficiencies

with the AC2 system. U.S. combat operations frequently highlight “difficulties integrating airspace control and fires deconfliction over and within a ground commander’s AO” (Headquarters, Air Combat Command 2009, vii). The analysis highlighted doctrinal disconnects and AC2 training deficiencies between the services. Most importantly, there is no C2 system designated by doctrine or created out of necessity that facilitates the integration of and horizontal communication among all air ground operations.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

> Improvement will require not only technological solutions, but also cultural change--a willingness to challenge standard practices, and question current organizational patterns and command practices.
>
> —General Richard B. Myers,
> *Chairman Joint Chiefs of Staff*

The purpose of this research analyzed the doctrine, organization, and training regulating AC2 to formulate recommendations on how to enhance integration of all operations over and within the ground commander's AO. There are several inefficiencies with current AC2 doctrine, its organization and training. This chapter provides recommendations on how to improve the effectiveness, efficiency, and the overall safety of airspace operations.

Conclusions

The AC2 structure must be integrated. Extensive research and analysis validate that the AC2 system must be flexible and scalable (Neal 2007). The AC2 system should be designed to integrate and coordinate all consumers of the airspace over and within the ground commander’s AO. The AC2 system itself must be responsive to current daily operational needs and requirements but remain flexible enough to meet future requirements. The AC2 system must be a joint organization whose positions, responsibilities, training, and authorities are defined in doctrine. Doctrine and stakeholders should be supported by senior leadership.

Doctrinal Recommendations

Doctrinally, guidance should be given on the roles, responsibilities, requirements and desired outcomes of an AC2 Section. Doctrine should address connectivity standards between joint and coalition environments. Doctrine should update its terms, refine and define AC2 relationships and define AC2 organizations. Doctrine should also address managing the risk of dynamic retasking and integrating operations in highly congested areas. Doctrine needs to address how to maximize on opportunity targets, being able to redirect assets quickly to attack a target with available platforms already utilizing the airspace in vicinity of a target.

Doctrine should provide additional guidance for prioritizing airspace usage. The CAOC currently publishes a document prioritizing operations, the air operations directive, but doctrine does not state or recommend how to perform prioritizations of air ground operations. For example, when a JAOC that is responsible for three theaters of operations is required to produce a daily air operations directive based off the JFC's guidance, the process is complicated when the JFACC is not collocated. In OIF, the process is further complicated as the JFACC must account for all operational priorities of MNC-I and MNF-I in addition to MNF-W and host nation priorities as there is no clear AC2 structure.

Most importantly, doctrine should define the responsibilities and authority of an AC2 Cell clearly. The AC2's required inputs and expected role in all facets of an operation from conception through execution, and the level of authority the section members have should clearly be published in order to give the AC2 system appropriate credibility and authority. A single theater AC2 POC should be designated with authority

for that specific theater of operations. The current situation is confusing, to say the least, and made even more complex with the addition of civilian air traffic. In lieu of theater specific doctrine to address many of these complexities, the ACP or SOP should adjust to the phase of operation and needs to account for coalition and alliance forces. Additionally, doctrine should provide or recommend the JFACC extend or give the ACCE some actual authority to assist with facilitating air ground operations in both immature and mature theaters of operations.

Organizational Recommendations

Organizationally, a tailorable model similar to the JAGIC is most ideal. A JAGIC seems to be the most ideal organizational AC2 construct. The JAIGC is similar to how the AC2 Cell at the National Training Center was formed and has effectively been running for over five years. The AC2 Cell at NTC serves as the rotational unit's Division and sometimes Corps AC2 Section. The NTC AC2 model collocates all the AC2 organizations and activities in order to facilitate collaboration. The JAGIC encapsulates the NTC system. The JAGIC is a joint concept that captures years of collaboration between the Army and Air Force on how the Services intend to integrate Joint air-ground C2 across the full spectrum of operations.

The optimum AC2 assignment should require some qualifying criteria for personnel assigned that mandates training for AC2 managers and operators to achieve and maintain a minimal level of proficiency. Ideally, the Army would adopt the Air Force's philosophy of making airspace managers a functional area or career field. Airspace coordination and considerations should be a common core task. If the Army

wants to adopt the combined arms mentality it must practice thinking three-dimensionally.

In lieu of adopting a modular scalable system, the TAGS should become more flexible, enhanced by technology in such a way that the system provides more timely, tactically useful information to the operator in order increase the overall combat effectiveness of all operations. ASOCs in the past did not have the means to access near real-time sensor data or a near real-time air picture like they can now. Previously, Airborne Warning and Control System and Joint Surveillance Target Attack Radar System platforms as with most AC2 systems did not have satellite communications and mIRC capability like they can access now. New organizational concepts should be explored, experimented, and evaluated to enhance the capabilities of the systems within the TAGS.

Marine integration in the joint environment, coupled with an overall operational warfighting JFC could assist in the process of integrating all air assets across the theater. This would promote a truly joint environment with the ability of more, if not all Marine assets to be used across a theater. Marine integration is a current topic of continued discussion by Army-Air Force-Marine Warfighter Talks which would require a paradigm shift in how the Services organize. Additionally, the JACCE could and should facilitate the integration of Marines. At a minimum, the JACCE must be intimately involved in all facets of the operation from the planning process throughout the command and control of the execution.

The Army should advocate the inception of a joint, modular, scalable and tailorable AC2 system as the Army continues its transformation to a modular force. The

AC2 system should mandate the collocation of decision makers, particularly AC2 activity decision makers, and facilitate better communication and integration between the AC2 activity and AC2 stakeholders. A modular system maximizing the collaboration of the AC2 stakeholders would increase overall situational understanding and the safety of all air ground operations.

Training Recommendations

All AC2 stakeholders should receive airspace training: they currently do not. Either the training of airspace users or AC2 members is minimal or there is no standardization program that enforces airspace proficiency. There are no airspace training requirements in Army Regulation 350-1 nor is it a subject often found in the curriculum of the formalized Service education system. There should be doctrinal and senior leader enforcement of requiring training on air ground integration and overall airspace operations. The Department of Defense should consider standardizing airspace management sections and the personnel training. Most AC2 systems are located in joint environments in which the AC2 staff should be familiar with the joint AC2 structure and its abilities and capabilities to maximize each of the Service's functions. Therefore, each subcomponent, such as the Division AC2 Section, AOC and CRC personnel should receive improved and enhanced training on airspace operations procedures prior to arrival in theater. In addition to standardizing and updating the roles and responsibilities of AC2 personnel in doctrine, airspace designated personnel must receive training on the systems they are expected to use.

Once personnel are identified for deployment, AC2 personnel should be mandated to participate in pre-deployment training that emphasizes co-located CRC and ASOC personnel to capture vital TTP and lessons learned. Training for airspace managers at the Division level and higher should be "joint." Therefore, training should include instructions on and include exercises that cover each service's airspace system to familiarize all air ground stakeholders with all military forces systems and idiosyncrasies. Army aviators and fire support controllers, Air Force Joint Tactical Air Controllers (JTACs) and Tactical Air Control Parties (TACPs) should be familiar with USMC procedures and vice versa.

Above all, commanders at all levels must understand the capabilities of all the airspace users and mangers in addition to the AC2 structure. Airspace training should be emphasized at the lowest levels and at all stages of the Officer Education System and Non-Commissioned Officer Education System. Training would stress the importance of air ground operations, clarify some of the procedures and enable leaders to intelligently support airspace operations. Since the smaller UAS are down at the squad level, operators should be supervised. Leaders of the SUAS should be held accountable for their operators' standardization and proficiency training, as well as understand and stress the importance of complying with airspace procedures.

Leaders must fundamentally understand the complexities of the airspace and have a basic understanding of airspace processes and procedures. This understanding is paramount to the leader's ability to enforce established standards. The leader's airspace comprehension is important in streamlining the airspace procedures and efficient

implementation is needed to eliminate unnecessary redundancies while still providing the ground commander the ability to conduct indirect fires.

Leaders should also take advantage of the CTCs and BCTP's unique ability to present a complex joint training scenario to units. The scenarios offer an array of target types and often a mixture of assets, from fires to attack aviation, and multiple UAS assets organic to the unit. The CTCs specifically offer an array of role players from the joint community available to replicate the most realistic scenario. The CTCs provide planners all the way up to the CAOC level integrate into the CTC's scenarios. CTC joint planners provide knowledgeable decision-making criteria and mentorship on weapon selection, collateral damage estimate considerations, target location, platform selection and airspace integration. At the minimum, live interservice assets and liaison officers are on hand at the CTCs to integrate into the unit's training, a scenario more units should strive to optimize during any and every training opportunity.

The high military operational tempo makes it difficult to maximize joint training opportunities and to establish habitual relationships between the services because of different deployment cycles. However, efforts should be made to maximize the use of technology, from simulating joint operations to integrating live joint asset feeds through digital connections. Greater emphasis should be placed on mandating joint operations and promoting ingenuity to involve other services to facilitate and promote joint planning, training and execution.

Recommendations

There is no single solution to improving the functionality or efficiency of AC2. A concerted effort to maximize available solutions to improve the overall efficiency and safety of airspace operations should be made. In particular, there should be a focus on revising doctrine that includes guidance to joint staffs on their roles and responsibilities in the AC2 process, that recommends and compliments a modular, tailorable organization, and that directs personnel trained in joint and airspace operations. To remain flexible and functional, an AC2 Cell must be adaptive. To echo the Joint Airspace Command and Collection and Analysis Team, "Create a Joint Airspace Command and Control team for Army and Air Force skill-sets at the division to enable airspace control (Center for Army Lessons Learned 2006, 5). One caveat however is, the AC2 system members should be a representation of the stakeholders it is controlling. Solutions should include a joint modular AC2 system with the doctrinal authority to optimize horizontal communication and integration of airspace operations down to the lowest levels.

Doctrine needs to be updated continually to reflect the most current TTPs. Among the doctrinal manuals requiring revision are JP 3-52 and FM 3-52. Revisions should update terms and clearly define the roles and responsibilities of AC2 members and systems. Joint training, especially training replicating airspace complexities, whether live or simulated, should be conducted as often as possible. Joint training, live or simulated should be optimized at every opportunity and reinforce the TAGS and AAGs relationships.

Recommendations for Further Study

Throughout the analysis of this thesis, the scope of the research focused on the first three elements of DOTMLPF. The study also revealed several inefficiencies that affected the remaining areas of DOTMLPF, specifically materiel, leadership, personnel and facilities that should be studied further. With regards to materiel, the implementation of technology that allows all airspace users to be seen by an AC2 system and that provides a sense and avoid capability would greatly promote the safety of air ground operations. Additionally, upgrades to software in the AC2 that improve interoperability between all AC2 activities but also between services would increase AC2 situational understanding. Further study should also be conducted to glean the utility of simulations to promote realistic joint airspace training especially with a lack of live joint assets and training facilities.

As former Joint Chiefs of Staff, General Myers stated, the key to transformation is the area “between our warfighters' ears” (Garamone 2004). Adapting many of the proposed recommendation within this thesis will require a cultural change. In order to best facilitate the shift and advocate the change, Leadership must be involved. Leadership at all levels must be educated on the complexities of the airspace, have a general knowledge of airspace procedures, air ground operations and all the airspace users in order to best leverage the ACS to enhance all operations. The level of education required in the Officer Education System and Non-Commissioned Officer Education System should be further studied to achieve the cultural change. Training should be institutionalized at all echelons and among all ranks to clarify airspace procedures and emphasize the intricacies of AC2.

Further research on how to leverage personnel already authorized in the Table of Organization and Equipment may also be beneficial. Simply requiring the collocation of AC2 activities and joint airspace liaisons would facilitate situational awareness and understanding of air ground operations. A study should be performed to determine who best should supervise the integrated cell and what authorities should they be given. Additionally, the personnel management and oversight of the personnel requirement to fill AC2 positions should be of qualified ACS personnel.

A study should also be conducted to gather the benefits of making airspace management a military occupational specialty. A career field or military occupational specialty designation would increase the caliber of airspace managers and standardize their training.

Finally, the study of making simulation facilities available to support the training should be considered as well. Depending on the size and capability of the facility, the simulation facility could greatly enhance the realism of training at all echelons.

The remaining portions of DOTMLPF should definitely be researched. Further study should focus on the best and most efficient ACS available at echelons above brigade. Specifically, organizations that maximizes the effectiveness of all airspace users and decreases the risk of integrated operations.

Conclusion

In summary, the purpose of this research was to analyze the doctrine, organization, and training governing AC2 in order to formulate recommendations on how to account for all of the airspace complexities and enhance the integration and safety of

all air -ground operations. The current AC2 system in use in OIF or OEF is neither effective nor efficient. Part of the airspace problems are due to the lack of joint integration and interoperability inherent in today's service-centric approach to doctrine, organization and training.

Based on the need for a flexible and responsive AC2 system, the incorporation of a modular AC2 system should be a critical aspect of the Army's modular transformation. Many of the lessons learned in Afghanistan and Iraq, and training trends from the CTCs and BCTP reflect very similar tendencies and concerns. Additionally, there is still an open JUONS requesting Department of Defense assistance to identify positively all airspace users at low altitudes and to provide an accurate operational picture throughout the command.

The fact that the combatant commander requested assistance in performing the most fundamental of the AC2 functions, identifying all airspace users, speaks volumes and is indicative of this thesis' significance. The U.S. Armed forces requires the capability to identify all airspace users rapidly; provide procedural control throughout the AO, and positive control in specific areas. Doctrine should foster the development of and practice of policies, standards, and procedures that enable safe and effective operations between manned and unmanned systems. A modular, scalable AC2 organization should be able to perform AC2 functions effectively and efficiently. Mandated training would enforce airspace processes and procedures. The research and analysis performed in this thesis demonstrate there is a significant need to revise doctrine, current AC2 training and create a functional joint air ground C2 system that meets the needs of the warfighters, maximizing air ground combat effectiveness safely.

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USACGSC
100 Stimson Ave.
Fort Leavenworth, KS 66027-2301

Mr. Edward D. Jennings
CTAC
USACGSC
100 Stimson Ave.
Fort Leavenworth, KS 66027-2301

Dr. Yvonne Doll
DCL
USACGSC
100 Stimson Ave.
Fort Leavenworth, KS 66027-2301