REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
22-03-2018	Master's of Military Studies	JUL 2017 - MAR 2018

4. TITLE AND SUBTITLE

Integration of Air Power 1914-1991: A Model of Success for the Integration of Emerging Domains within the Multi-Domain Battle Concept

5a. CONTRACT NUMBER
N/A

5b. GRANT NUMBER
N/A

5c. PROGRAM ELEMENT NUMBER
N/A

6. AUTHOR(S)

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5d. PROJECT NUMBER
N/A

5e. TASK NUMBER
N/A

5f. WORK UNIT NUMBER
N/A

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
USMC Command and Staff College
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2076 South Street
Quantico, VA 22134-5068

8. PERFORMING ORGANIZATION REPORT NUMBER
N/A

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)
Dr. Craig Swanson

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
N/A

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release, distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT
The mandate for integrated cross-domain operations is clear after studying the statements from the Joint Force. Evolution of military capabilities across all domains requires innovative doctrine and TTPs that will govern the development and employment of Multi-Domain Battle concepts in the future. The integration of new domains into a combined arms approach for the 21st century does have historical parallels. The study of the integration of the air domain provides three valuable lessons on the benefits of designating functional component commanders (FCC). First, a FCC provides the ability to mass firepower quickly while maintaining economy of force. Second, a FCC allows for the efficient and effective targeting at the strategic, operational, and tactical levels. Third, a FCC delivers the ability to remain flexible enough to respond to a dynamic battlefield but also has the structure necessary to create order in the face of complexity. The Joint Force must organize to operate in all domains from a centrally controlled multi-domain operations center that will optimize operational command and control and integrate capabilities in order to maximize warfighting functions.

15. SUBJECT TERMS

Joint Force Cyber Component Commander; USAF; Operational command and control; Air power; Multi-Domain Battle

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			USMC Command and Staff College(
Unclass	Unclass	Unclass	UU	51	**19b. TELEPHONE NUMBER** *(include area code)* (703) 784-3330 (Admin Office)

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MASTER'S OF MILITARY STUDIES

Integration of Air Power 1914-1991: A Model of Success for the Integration of Emerging Domains within the Multi-Domain Battle Concept

SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

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AY 2017-18

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Executive Summary

Title: Integration of Air Power 1914-1991: A Model of Success for the Integration of Emerging Domains within the Multi-Domain Battle Concept

Author: Major Joseph Witherspoon, United States Air Force

Thesis: The Joint Force must organize to operate in all domains from a centrally controlled multi-domain operations center that will optimize operational command and control and integrate capabilities in order to maximize warfighting functions.

Discussion: The mandate for integrated cross-domain operations is clear after studying the statements from the Joint Force. Evolution of military capabilities across all domains requires innovative doctrine and TTPs that will govern the development and employment of Multi-Domain Battle concepts in the future. The integration of new domains into a combined arms approach for the 21st century does have historical parallels. The study of the integration of the air domain provides three valuable lessons on the benefits of designating functional component commanders (FCC). First, a FCC provides the ability to mass firepower quickly while maintaining economy of force as demonstrated by General Carl Spaatz in the employment of limited air assets in the North African theater during World War II. Second, a FCC allows for the efficient and effective targeting at the strategic, operational, and tactical levels. A JFACC with the same authorities as General Charles Horner during the Gulf War could have alleviated the targeting issues between the tactical air forces and the Combined Bomber Offensive in Europe. Third, a FCC delivers the ability to remain flexible enough to respond to a dynamic battlefield but also has the structure necessary to create order in the face of complexity.

Conclusion: Multi-Domain Battle is not a fleeting concept. The ability to effectively integrate and Command and Control (C2) emerging domains will become more important even as technology continues to develop at an incredible pace. The designation of a Joint Force Cyber Component Commander (JFCCC), rooted in the historical lessons learned from the integration of the air domain and the designation of a JFACC, will provide a much-needed doctrinal foundation upon which to increase cross-domain lethality.

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Acknowledgements

My first and highest gratitude must go to my wife. Her patience and support during the writing process have been inexhaustible and key to any successes I might claim. I would also like to extend a special thank you to my mentor, Dr. Craig Swanson, whose steady hand and keen eye have been vital to the evolution of this thesis.

> The strategic environment is uncertain, complex, and changes rapidly. While the nature of war has not changed, the character of warfare has evolved. Military operations will increasingly operate in a transregional, multi-domain, and multi-functional (TMM) environment. TMM operations will cut across multiple combatant commands and across land, maritime, air, space, and cyberspace.[1]
>
> *- Joint Publication 5-0*

As the world becomes increasingly inter-connected and complicated, the character of war must inevitably follow in its convoluted path. The onslaught of information and technology will fuel military complexity and ambiguity which will likely result in a lack of focused decision-making and an inability to accurately predict future operating environments.[2] Technology and its associated data is growing exponentially. Futurist Ray Kurzweil estimates that technology has advanced one million times between 2000 and 2007 and this advance is not slowing. Kurzweil predicts that by 2030, a $1,000 computer will be a thousand times more powerful than the human brain.[3] Therefore, it is almost impossible to accurately predict the capabilities that might be available to a commander in twenty years; a more useful exercise is the development of a more comprehensive doctrinal approach to integrating future capabilities. Though there is always room for improvement, the Joint Force has made major advances in integrating warfighting functions across the physical domains of air, land, sea, and space. The information environment, which includes the cyberspace domain, is still a new frontier that has service branches scrambling to find ways to effectively integrate it into a cohesive multi-domain battle concept.[4] The Joint Force must organize to operate in all domains from a centrally controlled multi-domain operations center that will optimize operational command and control and integrate capabilities in order to maximize its warfighting ability. This paper will review and analyze existing multi-domain battle operating concepts, provide historical context for the integration of new warfare domains, and deliver doctrinal recommendations for the optimal method to command and control forces within a multi-domain battle framework.

The Multi-Domain Battle Concept

The idea of Multi-Domain Battle is not new. Thousands of years ago military leaders contemplated how to integrate the emerging maritime domain with the land domain. As new domains are added, the requirement to harness and weaponize potential capabilities remains as strong as ever. *Joint Publication 5-0* is very clear that the US military must be able to fight in all five domains: land, sea, air, space, and cyberspace. This addition of each new domain adds a significant layer of complexity. Multi-Domain Battle has become an important buzzword in the warfighter's lexicon and is a concept that must be included in any serious discussion of future warfare. The fact that the Department of Defense has yet to publish a conclusive definition of Multi-Domain Battle has not stopped the separate Services from hurriedly launching an attempt to determine where their Service-specific capabilities fit in and how this concept affects current doctrine and tactics, techniques and procedures. For the purposes of this discussion, Multi-Domain Battle is defined as: "The convergence of capabilities to create windows of advantage (often temporary) across multiple domains and contested areas throughout the depth of the battlespace to seize, retain, and exploit the initiative; defeat enemies; and achieve military objectives."[5] It is important to first examine how each service branch understands Multi-Domain Battle.

The commanding general of the U.S. Army Training and Doctrine Command, General David G. Perkins, begins the first of three articles on the Multi-Domain Concept by comparing today's operational environment to the environment that American forces encountered at their entry into World War I. The American Expeditionary Forces failed to adapt their doctrine to the operational environment of the Western Front prior to entering the war and subsequently paid dearly in casualties. The mandate is clear; if the Joint Force either cannot or will not make the

necessary changes in its doctrine, then it will pay the price in future conflicts. Gen Perkins sees the U.S. military at a similar crossroads but without the same room for any miscalculations on what it might take to defeat the enemy of tomorrow. The Army's concept of Multi-Domain Battle seeks to build on the precepts of the AirLand Battle, which was conceived in the aftermath of the Vietnam War and upon the realization that the Army was unprepared for major combat operations on the central plains of Europe against a peer adversary. Three takeaways from AirLand Battle have specific importance to Multi-Domain Battle.

- First, the visualization of the battlefield into a specific framework in the AirLand Battle provides the basis to extend that framework across the range of current enemy capabilities and across multiple domains.[6]

- Second, the necessity for decentralized execution or what the Army now calls mission command is even more of a priority as the battlefield becomes more complex.[7]

- Third, the concept of integrated battle, which was originally the idea of maneuver, synchronization, and firepower being integrated in execution on the battlefield[8], becomes even more important as warfighting domains are added and technology exponentially increases battlefield actions that might be possible.

As the battlefield is expanded to near limitless proportions by information operations, electronic warfare, and technologically advanced conventional weapons, it has also been compressed as there is a potential to be engaged simultaneously with long-range fires in multiple domains from home station through the close battle and into the deep area.[9]

In his second article, Gen Perkins describes the need for doctrine to sufficiently define how to "synchronize capabilities in sea, cyber, or space domains during large-scale combat operations against peer opponents."[10] The Army is attempting to remedy this problem with the late 2017 release of *Field Manual (FM) 3-0, Army Operations,* which is intended to refocus operations on large-scale combat operations after a decade spent focusing on low intensity conflict.[11] *FM 3-0* recognizes that the multi-domain approach is not new and this will not

happen without an external forcing function. Instead, "Rapid and continued advances in technology and the military application of new technologies to the space domain, the Electromagnetic Spectrum (EMS), and the information environment (particularly cyberspace) require special consideration when planning and converging effects across all domains."[12] While doctrine remains a long ways from the generation of Tactics, Techniques, and Procedures (TTPs), and will therefore always seem somewhat vague, the imperative to integrate capabilities across domains rather than attempt to synchronize an associated set of stove-piped capabilities[13] means that the warfighter must train to include all domains during operations.

In his third article, Gen Perkins discusses the need to continually push military thinking to understand and envision the operating environment of the future. US forces should expect that all domains will be contested and that it is unrealistic to maintain dominance in all domains at all times. Instead joint forces must be able to penetrate enemy defenses at a time and place of its choosing in multiple domains by opening up windows of domain superiority.[14] The speed of current events demands that multi-domain solutions be available no matter the circumstances.[15] Of note, cross-domain fires and a network able to deliver a common understanding of the operating environment, while sharing information horizontally and vertically, are specifically mentioned as capabilities that must be included in any workable Multi-Domain Battle concept. The ability to command and control forces in such a complex environment is essential.

Success in Multi-Domain Battle will only occur as a joint effort. To address this requirement, the Army and Marine Corps published a joint white paper in February 2017 entitled *Multi-Domain Battle: Combined Arms for the 21st Century*. The foundational concept of the paper is to create combat forces that are "capable of outmaneuvering adversaries physically and cognitively through the extension of combined arms across all domains."[16] Combined arms

creates an environment where even as the enemy counteracts operations in one domain, it becomes susceptible to actions in another. The cumulative effect is a situation where the enemy is presented with an overwhelming number of dilemmas and the Joint Force is able to create windows of dominance in order to seize positions of relative advantage.

The *Marine Corps Operating Concept* (*MOC)*, published in September 2016, seeks to add depth to the idea of combined arms in the 21st century. Marine Corps leadership has fully embraced the idea that the future of warfare will require actions in and across all domains, especially those in space and cyberspace where Marines will have to "fight for information and *with* information."[17] Specific tasks in the MOC include:

- Develop an organizational and employment construct for information warfare efforts to ensure the Marine Air-Ground Task Force has a cohesive, organic capability to operate equally well across the five domains.
- Keep pace with the ever-changing technologies to succeed on a battlefield where the ability to conduct cyberspace operations is as important as the ability to perform C2, maneuver, or fires.
- Deliver cyberspace and electronic warfare fires via a wide variety of Marine Air Ground Task Force platforms.[18]

Concepts, of course, only provide a broad roadmap. The essential task as each service evaluates how it might function across multiple domains is to resist the urge to create service specific TTPs and, instead, evolve towards a truly integrated joint force rather than a synchronized system of stove-piped capabilities.

The 2015 *Air Force Future Operating Concept (AFFOC)* contains much of the same language and ideas as its Army and Marine Corps counterparts. The central tenet of the AFFOC is gaining operational agility, which is further broken down into the ability to rapidly generate and shift between multiple solutions to a problem set. While integration has been a core concept of airpower dating back to the United States Army Air Corps, "the Joint Force of 2035 will

instead place an adversary on the 'horns of multiple dilemmas' by swiftly applying different strengths to produce multiple approaches, and the Air Force will contribute by creating combinations of air, space, and cyberspace capabilities to achieve desired effects in the battlespace."[19] The *AFFOC* details the integration of air, space, and cyberspace domains; however, it also states that the joint team will reach its true potential only when those three domains are effectively integrated with the land and maritime domains.[20]

According to the *AFFOC*, effective Multi-Domain Battle relies on flexibility, speed, and coordination. Flexibility is manifested through Integrated Multi-Domain Operations where space and cyberspace are not just complementary domains but key operating domains that are not limited by rigid interdependence.[21] Speed is demonstrated through superior decision-making speed. The Air Force has access to vast amounts of data but remains limited by its physical ability to process information into actionable data. The AFFOC envisions an environment where air, space, cyberspace, and Intelligence, Surveillance, and Reconnaissance (ISR) assets share information seamlessly and aggregate disparate bits of information into a Common Operating Picture. Advances in human-machine interfaces will deliver information to the right warfighter at the right time in order to make risk appropriate actionable decisions.[22] The ability to coordinate across multiple domains reveals itself as Dynamic Command and Control. Current operations center around the Air Operations Center (AOC) and the Air Tasking Order (ATO), but in the future fight, stove-piped domain planning and execution must mature into multi-domain integration through improved planning, assessment, and organization flexibility. Ultimately, the Air Force must have the structure and personnel expertise built into its component headquarters to smoothly transition between domains while performing centralized control and decentralized execution.[23]

The mandate for integrated cross-domain operations is clear after studying the statements from the Joint Force. The evolution of military capabilities across all domains requires innovative doctrine and TTPs that will govern the development and employment of Multi-Domain Battle in the future. Fortunately, the integration of new domains into a combined arms concept for the 21st century does have historical parallels. Just over one hundred years ago, the air domain was beginning to make its presence felt on the battlefield. Military leaders had similar discussions with regards to the integration of the air domain into the already established land and maritime domains as they are having today in regard to the integration of space, cyberspace, and the information environment. The next section of this paper will explore how the air domain was integrated into a combined arms concept starting with World War I and culminating with the advent of the modern Air Operations Center (AOC) and the official designation of the Joint Force Air Component Commander (JFACC) during the Gulf War.

The Integration of the Air Domain 1914-1991

Heavier than air powered flight was very much in its infancy at the start of World War I. Prior to 1910, aircraft possessed limited capabilities that might aid a military organization. It is quite remarkable then that airpower had a surprisingly significant impact on combat operations during World War I.[24] Air units progressed from flying limited reconnaissance and artillery spotting sorties that might toss make-shift bombs out of an open cockpit to fleets of aircraft flying large-scale bombing missions with attached fighter escort. While production and technological limitations impeded air campaigns from realizing early airpower theorist and Italian Air Force General Giulio Douhet's vision as the penultimate strategic weapon, the foundation was laid for the inclusion of airpower into any meaningful discussion of combined

arms. The primary lesson learned was that airpower was most effective when it was practiced under the idea of centralized control and decentralized execution.

Early technological limitations made it difficult to include airpower into a combined arms operation. Even with rudimentary air-to-ground communications, the integration of reconnaissance sorties with artillery fires had devastating effects. In early September 1914, a wounded French infantry lieutenant told a French pilot how an airborne German spotter had relayed his unit's seemingly hidden position behind an embankment to an artillery battery. Twenty minutes after being spotted, the German battery unleashed a barrage that killed 70 percent of the soldiers and over half of the officers in the unit.[25] During the same time period, a German pilot named Maximilian von Cossel flew three flights on two consecutive days to direct devastating artillery strikes on British battery positions at Fort Condé. His primary means of communication with the ground was a flare pistol fired from his aircraft where the direction or color of the flare indicated different firing instructions. Dropping weighted messages or landing to deliver instructions were additional techniques used to communicate with the ground, but these were obviously slow and inefficient. The lack of quick and effective communication was deemed such an important capability gap that the German army contracted with private firms to develop wireless sets suitable for aircraft.[26]

The French made one of the more significant attempts during World War I to reorganize their force to improve the integration between the land and air components. In 1917, the French General Headquarters formed the autonomous Aerial Division (Division *aérienne*) that included all of the day bombers and half of the fighters, with the other half going to the land component. As the French army took the offensive that summer, the Aerial Division published Directive Number Five, which emphasized cooperation between the air and artillery. The document

omitted, however, any mention of coordination between the air component and tanks. When the Allied Commander, Gen Ferdinand Foch, commented on the requirement for better communication between the air and land components, the Aerial Division leadership blamed the army commanders for inadequate liaison. At the core of the problem was a misunderstanding of the Aerial Division's role in the offensive. The army viewed the air component as merely a reservoir of reinforcements to protect their observation aircraft rather than a stand-alone, but integrated, force capable of an offensive mission.[27] In essence, it was the same struggle over control and integration of the air domain that would manifest itself throughout subsequent wars and still happens to some extent today.

As technology advanced, operations within the air domain grew exponentially. World War II displayed much of the same tension between the air and land components that began during World War I. The idea that strategic bombing could provide a decisive knockout blow capable of winning a major war was a widely debated issue in the years leading up to and throughout World War II. Billy Mitchell, one of the most prominent and controversial American airpower theorists, was the chief proponent of strategic bombing during the Interwar Period. He viewed bomber aircraft as the primary means to bypass the stalemate of trench warfare and horrific slaughter of World War I; but, in order to reach its full potential, military leaders needed to employ the bomber as more than simply a complement to ground forces.[28]

Mitchell's idea was captured in a more doctrinal format through the publication of *Air War Plans Division One (AWDP-1).* In July 1941, President Franklin Roosevelt requested a comprehensive war plan to estimate the amount of men and equipment needed to win a war against the Axis powers. The Air Staff utilized this opportunity to insert airpower doctrine and theory into a major planning document rather than simply providing a chart of the numbers of

aircraft and bombs needed. In just 10 days, a group of airpower champions produced *AWDP-1* as a blueprint for strategic warfare in Europe.[29] While subsequent revisions changed specific targeting priorities and made other slight adjustments, the basic intellectual framework for the employment of airpower remained intact.

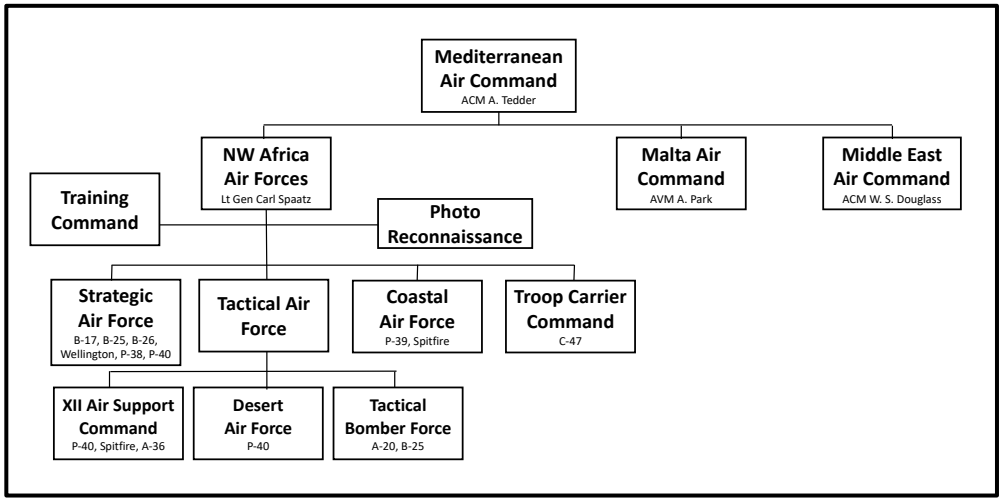
Much of the theoretical basis for *AWDP-1* was created at the Air Corps Tactical School (ACTS). The ACTS was founded during the Interwar Period and sought to establish the primacy of the bomber and develop its core principles of employment. In 1932, the ACTS Commandant Lt Col John F. Curry, stated that the school's mission should be a "clearing-house into which tactical ideas can flow, where they can be tried, and where the doctrine can go out to the service to be put into practice and evaluated."[30] It was at the Tactical School where the efficacy of striking vital centers began to take a firm hold. Billy Mitchell had previously classified vital centers as the "great cities, factories, raw materials, foodstuffs, supplies and modes of transportation"[31] of an enemy nation. Industry was viewed as a web of interdependent activities in which each relied upon the other.[32] The highest value targets were those links in the chain that, once destroyed, would disrupt the entire industrial process. Instead of obliterating the entirety of an industry, which might take a massive number of sorties and ordnance; destruction of a few critical nodes within this web would cause the entire industry to collapse upon itself.[33] Strategic bombing did not win the war singlehandedly as *AWDP-1* claimed; however, *AWDP-1*'s failure in that respect did not solve the ideological disagreement over the most effective way to integrate airpower.

In 1943, the Army Air Corps published *FM 100-20, Command and Employment of Air Power,* which centralized command and control of air forces in the hands of a single air commander and also explicitly stated the priorities for the employment of tactical aircraft. Air

superiority was designated the top priority, air interdiction was second, and close air support was third. Close air support was not necessarily neglected though. During the US Fifth Army's campaign in Italy, local procedures were implemented that attempted to integrate the air and land campaigns. Army and Air Corps headquarters were co-located so that planning could be integrated during commanders' daily meetings. G3 air sections were established at army, corps, and division levels. Daily photo-reconnaissance photos were distributed throughout the army planning staff in order to give analysts 24 hours to develop target sets. The army presented their prioritized pre-planned requests to the Air Commander at the daily operations meeting where army requests were weighed against other air objectives. Immediate air missions were also available through the use of jeep-mounted VHF radios operated by ground liaison officers.[34] Even though tactical problems were being solved, the philosophical debate over control of the air domain continued and the idea of functional component commands began to take shape.

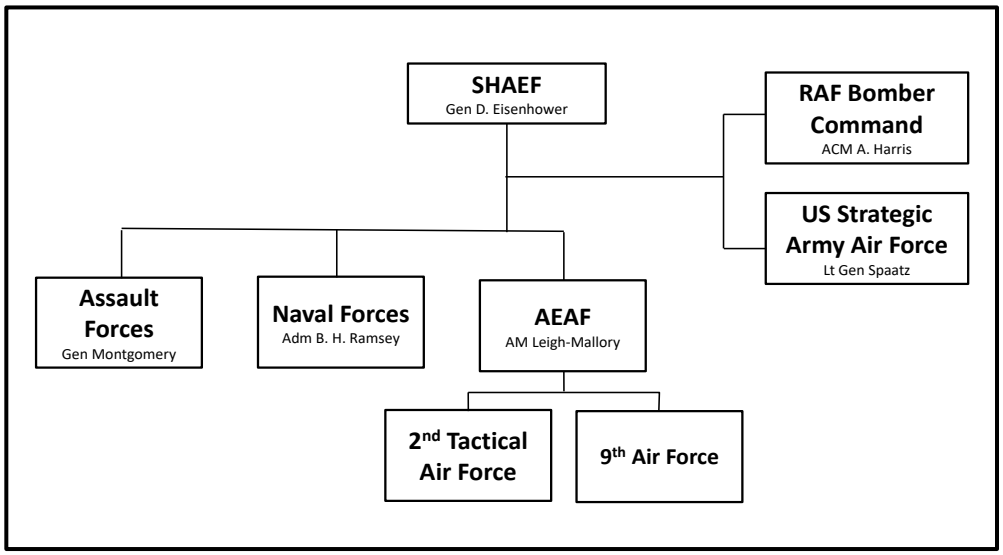
The precedent for component commands was initially set in North Africa when, due to a lack of organization and coordination between the air and land components, Air Chief Marshal Arthur Tedder was named component commander over all air forces operating in the Northwest Africa (NWAAF – Northwest Africa Air Force) theater and Field Marshal Harold Alexander was named the land component commander.[35] Through this re-organization of airpower, General Eisenhower contained all the air elements within a single command structure which were now able to fully integrate towards the common goal of gaining and maintaining control of the air and stopping the advance of the German Army.[36] (See Figure 1)

Figure 1 Mediterranean Air Command COMREL[37]



The functional component concept took a step back during the planning of Operation OVERLORD. Gen Eisenhower placed all tactical air forces under the control of Air Chief Marshal Trafford Leigh-Mallory (AEAF – Allied Expeditionary Air Force) but decided to keep bomber forces directly under his control.[38] (See Figure 2) After wrestling with the political

Figure 2 Air Command Structure for Operation OVERLORD[39]



ramifications of choosing between Gen Omar Bradley and Gen Montgomery, it was not surprising that Gen Eisenhower acted as his own land component commander during post-OVERLORD operations. This led to the disintegration of the AEAF and also increased the

strain on his own staff by requiring the ill-equipped Supreme Headquarters, Allied Expeditionary Force (SHAEF) to handle the long range strategic planning as well as the tremendous amount of tactical planning for all air and ground forces.[40] As a result, coordination and liaison at the theater level were poor compared to the Mediterranean campaign. Requests for heavy bomber support had to process through SHAEF, which created a situation where strategic air forces pursued Combined Bomber Offensive objectives while intermittently responding to the ground campaign's targeting requests.[41]

The lessons learned during World War II operations in Northwest Africa did not keep US forces from committing similar mistakes during the Korean War. General Douglas MacArthur, as the Commander-in-Chief United Nations Command, chose to dual-hat himself as the land component commander while the Air and Naval forces established component commands designated as the Far East Air Force (FEAF) and Naval Forces Far East Command (NFFEC). As a result of Gen MacArthur's decision, his supposedly joint staff was excessively weighted with Army personnel.[42] This had significantly negative effects on target selection for strike missions within the Korean theatre of operations.

Lieutenant General George Stratemeyer, Commander of the FEAF, had previously urged Gen MacArthur to allow the FEAF to plan targets for all air missions. Instead, Gen MacArthur's chief of staff elected to create a General Headquarters (GHQ) Target Group so that "basic selection and priority of target areas will be accomplished by the GHQ target analysis group with all services participating."[43] The issues with the GHQ Target Group began to manifest themselves immediately since members were not acquainted with the process of target selection. Some taskings required the FEAF to destroy railways in towns that contained no railways or strike objectives that did not actually exist.[44] The haphazard target selection process contributed

to the key city of Taejon falling to North Korean forces. When Major General Otto Weyland arrived in theatre as the FEAF Vice Commander, he immediately diagnosed the problems with the GHQ Targeting Group as being entirely too Army-centric and lacking an equitable representation of the air, naval, and land components.[45] The process for selecting targets went through significant changes and by 1952 the bulk of air targets were selected by the newly formed FEAF Formal Target Selection Committee which became the de facto agency for theater target selection and allowed the FEAF commander to execute targeting functions commensurate with the designation as the air component commander.[46] Even with the major overhaul in the target selection process, there were still inter-service rivalries to deal with between the Air Force, Navy, and Marine Corps with respect to the application of airpower.

Gen Stratemeyer struggled to define the command relationship between Air Force, Navy, and Marine airpower. On 3 and 4 July, aircraft from the aircraft carrier *Valley Forge* struck airfields around Pyongyang before the carrier was diverted to protect Formosa. When the *Valley Forge* returned to the area two weeks later, its jets spotted an oil refinery near Wonsan and they proceeded to bomb and strafe it. The pilots were unaware that Air Force aircraft had conducted a raid on the same refinery previously and had already caused an evacuation of much of the personnel and oil from the targeted refinery.[47] The arrival of Marine air units into the Korean War did not help to clarify command relationships. Marine aviation was specifically task organized to provide close air support for ground troops. Army commanders readily clamored for Marine air support to the extent that journalists published stories extolling the superiority of Marine tactics and technology versus those used by the Air Force.[48] Many in the Air Force were convinced that these stories were planted by the Navy to attack their image while political battles over funding, procurement, and service importance raged. The Eighth Army commander went

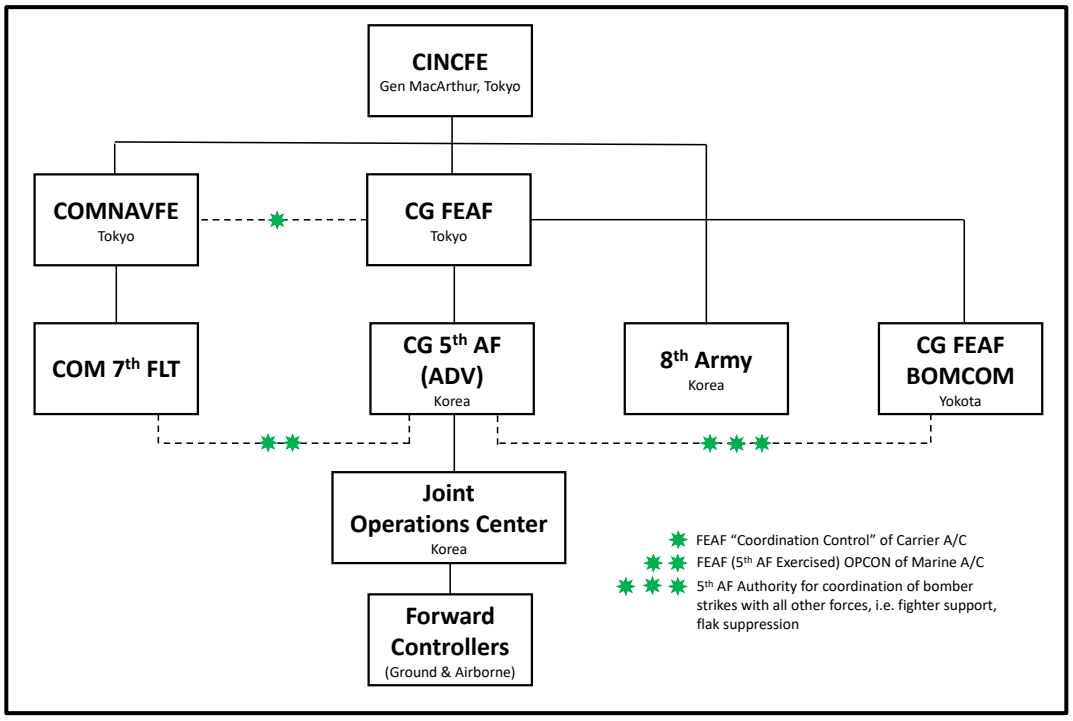
so far as to write the Army Chief of Staff that "the reaction of all ground commanders from company to corps level when I state that close support in this theatre has not been developed to the degree which ground commanders anticipated."[49] This lack of coordination and understanding of the overall air campaign between services was common.

The Air Force and Navy attempted to negotiate a solution with regards to control of the air domain. In response to the miscommunication over the strikes from the *Valley Forge,* Gen Stratemeyer requested that he be assigned operational control (OPCON) over all naval land-based and carrier-based aircraft operating over Korea or from Japan, except those aircraft that were exercising Navy specific tasks. Gen Stratemeyer reasoned that, as the air component commander, he required the authority to direct carrier aircraft operations "including the targets to be hit and the area in which they must operate."[50] The Air Force idea of operational control – which Gen Stratemeyer defined as "the authority to designate the type of mission, such as air defense, close support of ground forces, etc. and to specify the operational details such as targets, times over targets, degree of effort, etc., within the capabilities of the forces involved"[51] – did not sit well with the Navy. In a subsequent meeting, the principals involved agreed to the watered-down wording of "coordination control" as a means of defining how the FEAF exercised control of Navy aircraft. Though it gained meaning over time, the initial ambiguity of its phrasing prompted differences of opinion and misunderstandings about important orders.

Although there were still miscommunications on both overall intent and specific tactical direction, the refinement of the Joint Operations Center (JOC) did greatly enhance the integration of airpower. The JOC provided a facility where the Army commander could present requirements for air support and provided the Air Force commander with a mechanism to plan and control the supporting air effort. The JOC was divided into an Air Force combat operations

section and an Army air to ground section. The JOC operated in close conjunction with the Tactical Air Control Center (TACC), which served as the tactical direction and communications arm that was able to communicate with and directly task operating aircraft.[52] Eventually, the Navy was also integrated into the JOC. In 1952, during the elevated air-pressure campaign designed to bring North Korea to the negotiating table, Gen Weyland (now the FEAF commander) directed Fifth Air Force to invite Navy representation from the JOC to the FEAF Formal Target Committee. Consequently, in the last year of the Korean War, Air Force and Navy personnel worked well together and the JOC was a major contributor to that effort.[53] Essentially, the Korean War marked the first time a JFACC was employed.

Figure 3 Joint Policy Agreement for Control of Aircraft Operating Over Korea[54]



The lessons learned during World War II and then re-learned during Korea were forgotten once again during the Vietnam War. The Vietnam War was considerably different than previous conflicts, which led military leaders to believe that historical component command

relationships were not as viable for the current situation. The issue stemmed from a similar problem encountered in the command structure during the Korean War. The Military Assistance Command – Vietnam (MACV) joint staff was heavily laden with Army officers and lacked any ranking Air Force officers to help integrate airpower into the overall plan.[55] The consensus among military leadership was that Vietnam would primarily be a land-based counter-insurgency war necessitating a more pronounced Army specific command structure. This attitude was amplified by comments from Secretary of Defense Robert McNamara who stated, "The Army has to be primary in a land war. The Air Force is there to serve the Army in the airlift role and the close support role, and the Air Force must tailor its activities to the Army."[56] However, the air war had already expanded to the point that it required a more senior command element. 2d Advanced Echelon (ADVON) of the 13th Air Force activated in November 1961 and assumed control of Air Force combat operations within South Vietnam.[57] 13th Air Force elected to maintain operational control of assets based outside of South Vietnam so MACV could not serve as a potential roadblock if hostilities flared up elsewhere in Asia.

As MACV continued to expand, concerns over the stability of Laos led President Lyndon Johnson to send Joint Task Force 116 (JTF-116) to Thailand. Air Force assets were now fragmented between three commands. Units in South Vietnam were commanded by 2d ADVON; the units already in Thailand were commanded by 13th Air Force; and the recently deployed Tactical Air Command units belonged to JTF-116. Senior leaders noticed the convoluted command relationships and decided to make changes. A new sub-unified command, Military Assistance Command – Thailand (MACTHAI), was created while JTF-116 was simultaneously deactivated.[58] The Air Force units from JTF-116 were placed under the command of the newly created 2d Air Division. The 2d Air Division commander was now the

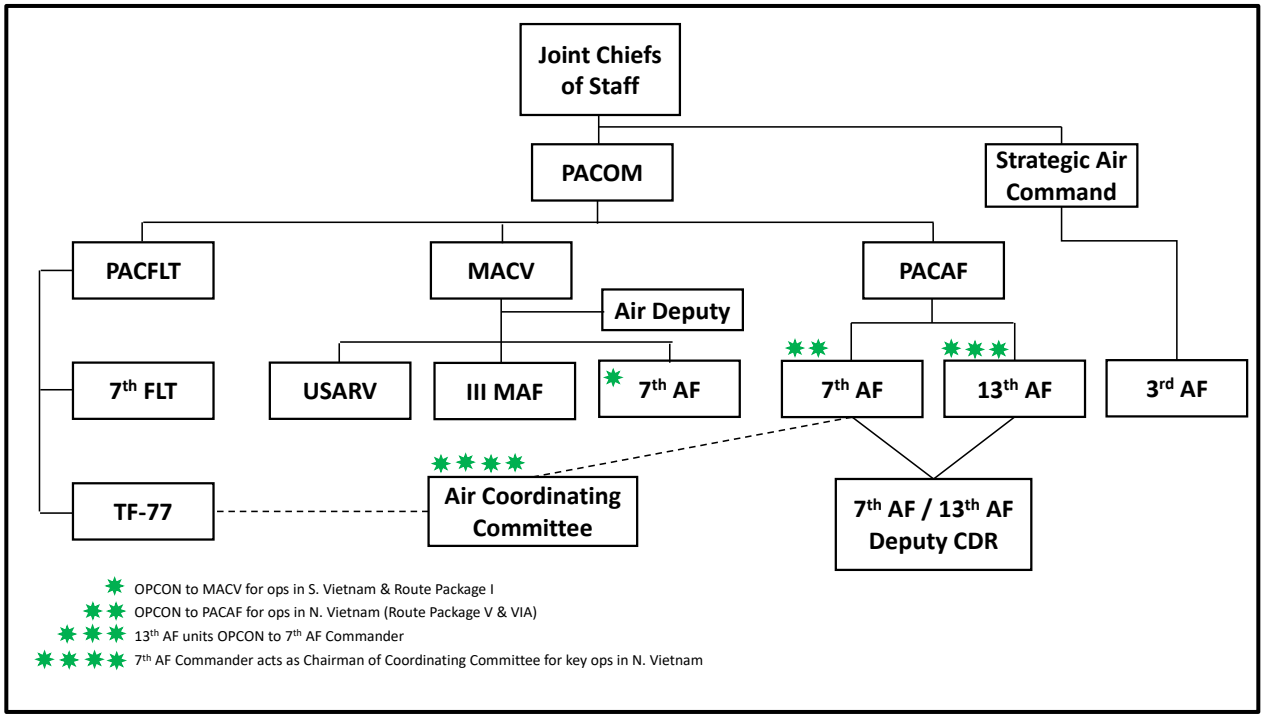
air component commander in both South Vietnam and Thailand.[59] For operations conducted in South Vietnam, he reported to MACV; for operations outside of South Vietnam, he acted as a forward commander for 13th Air Force. This somewhat improbable command arrangement was due to the fact that Pacific Air Forces (PACAF) wanted to retain control of the majority of air assets in Southeast Asia in case the air campaign was expanded to North Korea or even China.

Even as early as 1962, Air Force Chief of Staff General Curtis LeMay recognized that Vietnam needed a more efficient construct for the employment of airpower. Ideally, a similar one to those used in World War II and Korea. The Tactical Air Control System (TACS)[60] was not allowed to operate effectively and slow response times diffused the inherent ability of airpower to quickly mass firepower. Gen LeMay advocated for an Air Operations Center (AOC) that used the existing facilities of the TACS but would act as a central command and control node for all air operations within the theatre. The commander of MACV agreed that there needed to better coordination of air domain but refrained from giving full (OPCON) of all air assets to the Air Force. Instead, the AOC was tasked with coordination control and an Army element was placed within the AOC to help facilitate communication. Again, the scene was set for more confusion over what specific authorities "coordination" entailed just as there was in Korea a decade earlier.[61]

The arrival of I Marine Air Wing (MAW) in 1965 caused further confusion regarding the role of the air component commander. Originally, COMUSMACV had intended to place I MAW under the operational control of what was now 7th Air Force (originally 2d Air Division) but was overruled by CINCPAC, who allowed the Marines to establish an organic air control system: The Marine Air Command and Control System (MACCS). The MACCS was used to assign Marine aircraft to specific missions and monitor their activity throughout the theatre.

Thus, the commander of III Marine Amphibious Force (MAF) was allowed to exercise OPCON over all Marine aviation except in the event of an emergency, where OPCON would be transferred to COMUSMACV. The commander of III MAF was also instructed to provide any surplus[62] sorties to the air component commander for integration into the overall air campaign.[63] The entry of Marine aviation further fragmented the integration of air power in South Vietnam as there were now three competing air control systems without a single doctrinal commander to unify their efforts.

Figure 4 Airpower COMREL in Vietnam 1966-1972

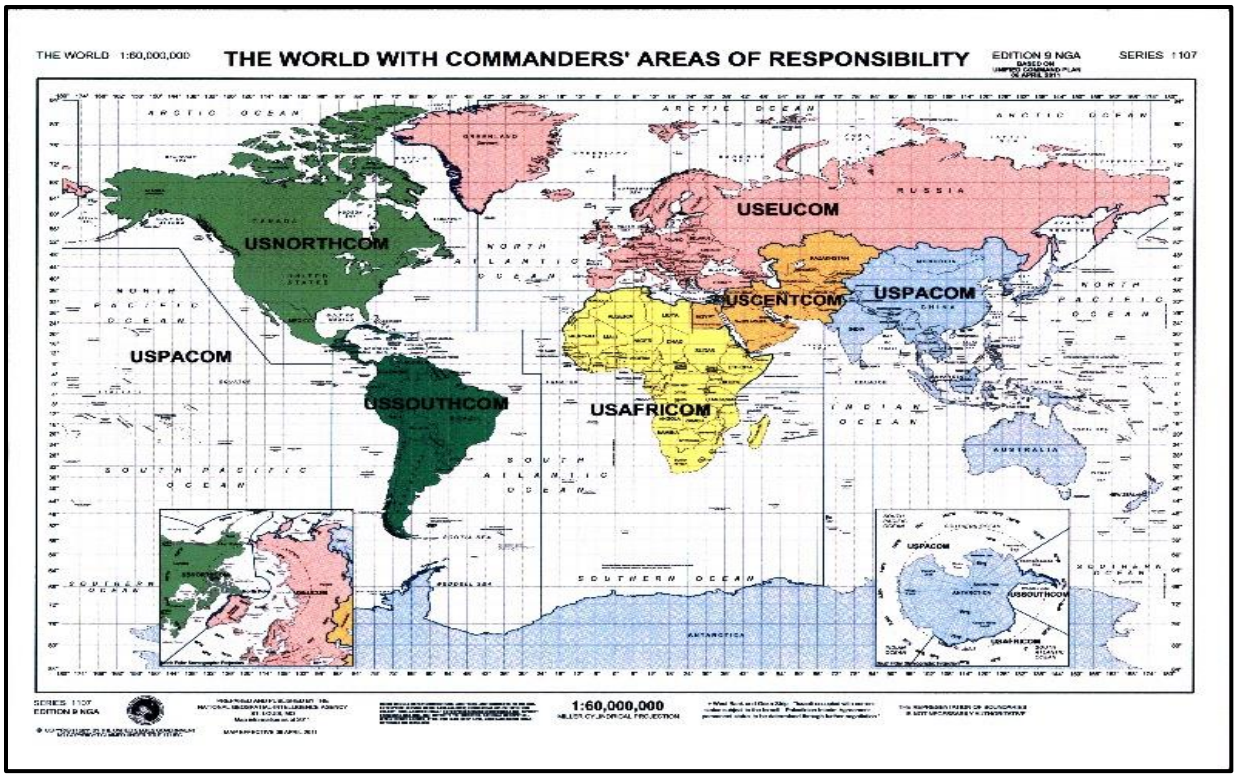


Control over naval aviation became a more pressing issue during the 1965 Operation ROLLING THUNDER bombing campaign. If Air Force and Navy airpower required centralized control during joint strikes over North Vietnam and Laos then the PACAF commander, as the air component commander for PACOM, believed that he was the appropriate controlling agency. The PACAF commander lobbied for operational control of all air assets

during ROLLING THUNDER. The Navy objected and PACAF's request was denied due to the large amount of influence the Navy had within the PACOM command structure. Since philosophical differences precluded true centralized control, 7th Air Force and Task Force 77 created the ROLLING THUNDER Coordinating Committee which proposed to divide North Vietnam into seven route packages[64] (see Figure 5) where the assigned service was free to plan and coordinate strikes on targets delivered form the Joint Chiefs of Staff (JCS). In the view of the air component commander, the division compartmentalized US airpower and reduced its capabilities. Too many Air Force sorties were diverted into route package I when inclement weather precluded them from accessing the northern parts of North Vietnam. Additionally, TF-77 had an inadequate number of aircraft for 24-hour coverage of all its assigned packages and deck cycle limitation further hampered their efforts.[65] The route package system was a compromise to a contentious command and control problem, but also spoke to the need for more forceful wording behind the integration of airpower across all services. Nothing could be more forceful than the 1986 Goldwater-Nichols Department of Defense Reorganization Act and its attempt to strengthen "unity of command" and emphasize joint operations through the establishment of combatant commands under the advisory oversight of the Chairman of the Joint Chiefs of Staff.[66]

Figure 5 Vietnam Route Package System

Figure 6 Unified Campaign Plan's Geographic CCMDs

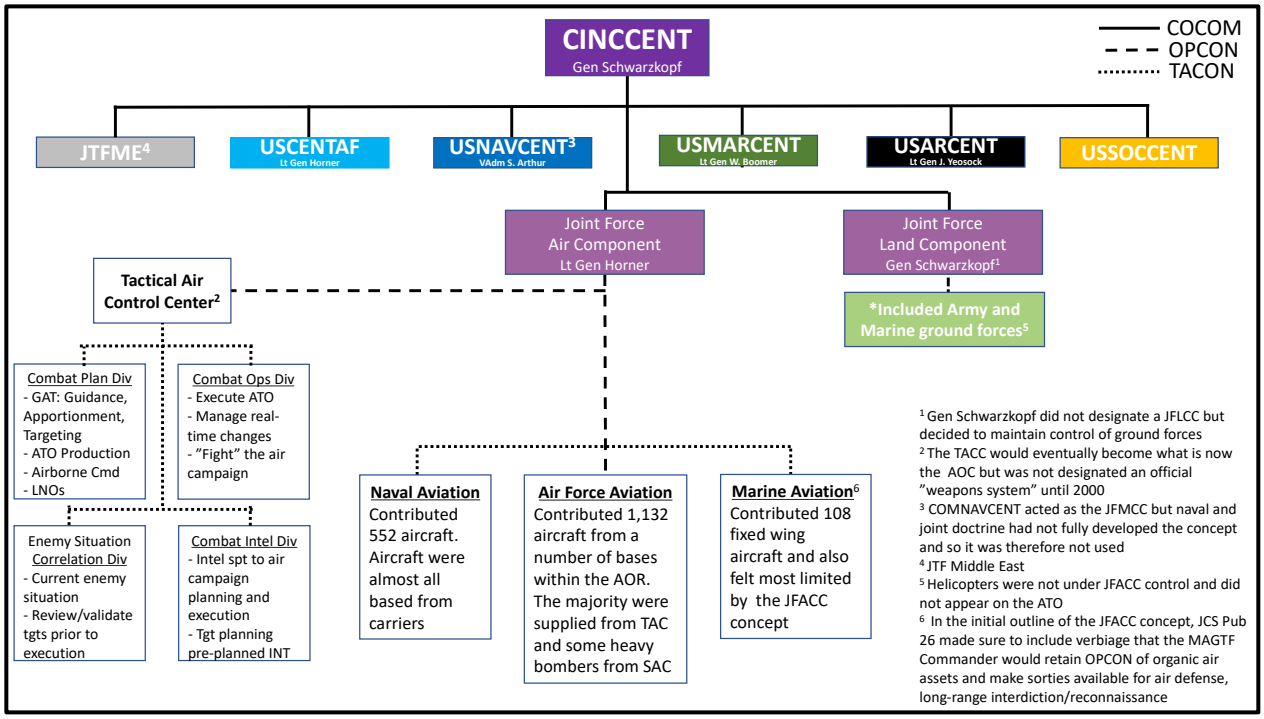


The Gulf War proved to be the culmination of the past 60 years of discussion and inter-service disagreements regarding the integration of the air domain. The lessons learned from Vietnam combined with a refocus from counter-insurgency to major theatre combat operations[67] and the disastrous Op EAGLE CLAW[68] hostage rescue, placed increased emphasis on joint operations. The Goldwater-Nichols Act redistributed power to the joint arena by creating Geographic Combatant Commands with commanders who had near carte blanche to organize and fight (OPCON over assigned force) within their Area of Responsibility (AOR).[69] Joint publications allowed commanders the latitude of designating component commanders (air, sea, land) but did not necessarily mandate this requirement.[70] In February 1989, 18 months prior to Iraq's invasion of Kuwait, the U.S. CENTCOM Air Forces commander (CENTAF), Lieutenant General Charles Horner, met with CENTCOM commander (CINCCENT) General Norman

Schwarzkopf to discuss roles and responsibilities. During the course of the conversation, Gen Schwarzkopf stated that he wanted Gen Horner to remain as his JFACC[71] and de factor Airspace Controlling Authority (ACA) and Area Air Defense Commander (AADC), meaning that he had primary responsibility for air operations within the AOR.[72]

Gen Horner also passionately believed that the JFACC should select targets for the Joint Force Commander (JFC – the CINCCENT is this particular case). Gen Horner's belief was strongly shaped by his frustrating experiences flying strike mission during Vietnam where target selection was performed at the highest command levels in Washington D.C and passed down to the tactical level. Instead, Gen Horner simply asked Gen Schwarzkopf to tell him what he wanted done and he would choose the targets to accomplish those objectives.[73] It might seem that such strong agreement between the CINCCENT and his air component commander would dramatically decrease the inter-service rivalries that were so common in past wars, but this was unfortunately not the case.

Figure 7 Airpower COMREL during the Gulf War



The JFACC controlled air operations through the TACS like in previous conflicts but also added the Air Tasking Order (ATO) as a comprehensive means of providing missions taskings for all fixed-wing aircraft flying in the AOR for the specified 24-hour period. During the INSTANT THUNDER bombing campaign, standard ATOs were often as large as a metropolitan area phone book, contained up to 3,000 sorties, and required two full hours to transmit. The Navy, due to incompatible communications equipment, was unable to receive the transmission and required paper copy ATOs to be flown from the TACC in Riyadh to the command ship. Once it was on the aircraft carrier, copies then had to be ferried to other ships via helicopter.[74] Gen Horner used the ATO to achieve the resource control he needed as the JFACC and believed it was "the key to legitimizing the JFACC by making the Navy and the Marines come on board."[75] Other members of the joint team were not as enthusiastic about the legitimacy of the JFACC. According to Colonel Brian E. Wages, Air Force liaison officer to COMNAVCENT, Navy and Marine staffers at NAVCENT felt that "the role of a JFACC was not…solidly grounded in joint doctrine, nor his authority and responsibility clearly delineated…Establishment of a JFACC was perceived as an attempt to require joint doctrine on the battlefield, subordinate one component commander to another, and enhance Air Force prestige…at the Navy's expense."[76] The Marines believed strongly that the JFACC's role as a commander was diametrically opposed to their doctrine and would reportedly address messages meant for the CENTAF commander to the "joint force air component **coordinator**" just to drive home their point.[77]

It was not just the term JFACC that caused the other services chafe. Many felt as though they were not being listened to, especially with respect to the targeting process. Army commanders submitted their list of targets according to the Air Force's targeting procedures but

did not gett the results they wanted. Of the 1,185 targets submitted by the Army, by the end of January 1991, only 202 (17 percent) had been included in the ATO and only 137 (12 percent) had actually been struck.[78] The Navy also believed the targeting process was too inflexible. Navy aircraft identified targets on routine sorties but were unsuccessful in getting those targets placed on the target list due to what they perceived as a clumsy targeting process mandated through the air tasking cycle (see Appendix A for more information on the ATO and the air tasking cycle). Vice Admiral Stanley Arthur, the senior Navy officer in the Persian Gulf, believed that the Iraqis had figured out the targeting process and were moving aircraft every day or so since it took three days to get all but the most critical targets included on the Air Force's target list.[79] Army leadership considered itself to be so marginalized in the targeting process that it sent a Situation Report (SITREP) to higher headquarters (the military equivalent of going public) stating that it received too few sorties to adequately shape the battlefield and that greater effort must be taken to better align the air and ground campaigns to ensure success of future operations.[80]

Marine Corps leadership went so far as to impose mission restrictions on their aircraft and eventually tried to withdraw all of their aircraft from the air campaign and conduct their own air war over southern Kuwait.[81] After the first thirty-six hours of the air war, the Marines decreased the amount of sorties offered up to the JFACC from 50% to 15%.[82] Lt Gen Royal Moore, commander of Marine air units in theater, also "gamed" the ATO process by overscheduling sorties and then cancelling the majority of them before they launched. By doing this, he was able to retain flexibility for the MAGTF since it would appear to the JFACC that there were no excess Marine sorties available for tasking.[83] The prevailing thinking among

Marines was that they should not drop a single bomb on Iraq until Marine ground forces had successfully launched their attack into Kuwait.[84]

While it is easy to focus on the negatives, it is impossible to disregard the positive effects that the air campaign, and therefore by default the JFACC, had on the outcome of the Gulf War. Coalition aircraft flew 110,000 attack sorties, special operations C-130s flew 830 missions, transport C-130s flew 46,500 sorties, and air refueling aircraft flew 15,434 sorties that provided gas to 45,955 receivers.[85] On the day prior to the ground invasion, the CINCENT's Battle Damage Assessment indicated that airpower had destroyed 1,688 tanks (39 percent kill rate), 1,452 artillery pieces (47 percent destroyed), and 929 (32 percent) enemy Armored Personnel Carriers.[86] The weak resistance put up by the Iraqi ground forces was undoubtedly impacted by the total air dominance demonstrated by the U.S. led coalition.

In contrast to the heavy damage inflicted, US air forces lost only 63 aircraft with 73 percent of those lost during non-combat operations. The low loss rates are even more incredible when viewed against the sheer volume of aircraft operating in the AOR (sometimes over 3,000 sorties per day!) and the vaunted Iraqi Kari integrated air defense system. Each sortie flying in the AOR was prescribed by an entry on the ATO. Often, due to weather, target changes, or timing changes, mission specifics had to be altered. There were an astounding 22,942 changes made to the ATO through day forty-three of the air campaign.[87] The incredible complexity of the air campaign demanded that a single entity be given sole authority to integrate airpower since multiple commanders would have added layers of confusion and corresponding friction.

The historical study of the integration of the air domain provides three valuable lessons on the benefits of designating functional component commanders (FCC). First, a FCC provides the ability to mass firepower quickly while maintaining economy of force as shown by Gen

Spaatz in the employment of limited air assets during World War II in North Africa. Second, a FCC allows for the efficient and effective targeting at the strategic, operational, and tactical levels. A JFACC with the same authorities as Gen Horner during the Gulf War could have alleviated the targeting issues between the tactical air forces and the Combined Bomber Offensive in Europe. Third, a FCC delivers the ability to remain flexible enough to respond to a dynamic battlefield but also has the structure necessary to create order in the face of complexity.

Current Doctrine

> National safety would be endangered by an Air Force whose doctrines and techniques are tied solely on the equipment and processes of the moment. Present equipment is but a step in progress, and any Air Force which does not keep its doctrines ahead of its equipment, and its vision far into the future, can only delude the nation in a false sense of security.[88]
>
> - Gen H. H. "Hap" Arnold, 1954

The integration of the cyberspace domain with the physical domains (air, sea, land, and space) is at a similar crossroads that the air domain found itself during airpower's infancy. The military recognizes that cyberspace has revolutionary warfighting capabilities. The integration of those capabilities, however, is done in an ad-hoc manner without the full force of joint doctrine behind it. Similar to previous conflicts, military organizations are adapting to dynamic situations and doing their best to take advantage of cyberspace capabilities. To take full advantage, however, the Joint Force should look to the history of the JFACC as a valuable lesson on how to integrate a new and inherently strategic domain. Just as airpower was able to dramatically alter the battlespace by giving commanders the ability to maneuver and mass forces at never before seen speeds, the cyberspace domain gives commanders to perform similar actions at the overwhelming speed of light. Better integration of cyberspace capabilities will only

happen if there are changes to joint doctrine and to the ways commanders think about integration.

Current doctrine is very clear on the benefits that functional component commands (FCC) provide to the Joint Force Commander (JFC). Joint Publication (JP) 1, *Doctrine for the Armed Forces of the United States*, states that JFCs establish FCCs to "integrate planning; reduce their span of control; and/or significantly improve combat efficiency, information flow, unity of effort, weapon systems management, component interaction, or control over the scheme of maneuver."[89] Normally, the Service component with the preponderance of forces and the ability to command and control those forces will be nominated as the FCC. In practice, this means that the ranking Air Force member will likely command the air component, the ranking Army member will likely command the land component, and the ranking Navy member will likely command the maritime component. While this is the normal division of labor, there is nothing prohibiting a Marine from commanding a component based on the disposition of forces in the operating area. The corresponding JPs for command and control of joint air, land, maritime operations[90] also endorse the concept of FCCs as a means for the JFC to spend time directing the overall campaign while decreasing the potential to get overly distracted by planning and execution minutiae within a particular domain. The cumulative effect of designating FCCs is a more synchronized and integrated joint force than alternate command relationships might provide.

The command and control of joint Cyberspace Operations (CO) presents a more difficult command relationship due to the continued rapid increases in technology and the relative newness of the capabilities. Joint Pub 3-0, *Joint Operations*, briefly discusses C2 of joint CO. Each CCDR must organize a staff capable of planning, synchronizing, and controlling CO in

support of defined missions and work with assigned cyberspace support elements (CSE) assigned via USCYBERCOM. While conveying the necessity of clearly established command relationships, JP 3-0 fails to give specifics to mention any type of command structure that places a single person in charge of the cyber fight like it does when discussing operations in the other domains. Although more specifics are detailed in JP 3-12, *Cyberspace Operations,* it is clear that a formalized and common integration function is missing.

Before examining the integration of CO in depth, it is helpful to first consider space operations and how they integrate into the joint fight. The cyber and space domain share many characteristics that might point to a common concept of employment and integration. Commander, US Strategic Command (USSTRATCOM) is designated by the Unified Command Plan to conduct space operations in support of CCDRs worldwide.[91] Control of space assets, however, is held tightly at higher echelons of command and eschews decentralized execution based on potential world-wide impacts that space operations can have. CDRUSSTRATCOM designates a Commander, Joint Function Component Command Space (JFCC SPACE) to conduct daily space operations. The purpose of JFCC SPACE is to provide unity of command in the unimpeded delivery of joint space capabilities to supported commander and, when directed, to deny the benefits of space to adversaries.[92] GCCs have the option to designate a Space Coordinating Authority (SCA) with delegated authorities for planning, integrating, and coordinating space operations with the operational area. Supported JFCs can choose to retain SCA, assign it to a component command under their command, or appoint another individual.[93] The Commander JFCC SPACE, utilizes the Joint Space Operations Center (JSPOC) as the primary means to C2 space operations. The JSPOC is built on the Air Force Air Operations Center (AOC) construct and is adapted specifically for space missions and global operations and

provides a reach back capability for SCAs.[94] The SCA usually operates from within the AOC and is able to observer and participate in the AOC targeting process[95] and is thereby able to integrate, deconflict, and educate regarding space assets' capabilities and potential effects. While this may seem like the ideal structure to simply plug and play CO into, there are distinct differences that call for an altered command structure. The low barrier of entry into the cyber domain for adversaries, from traditional nation-states all the way down to non-state actors and transnational criminal groups, necessitates a more responsive mechanism to C2 CO. Additionally, the rate of growth for space assets will be exponentially lower those assets related to cyberspace.

The current CO doctrine contained in *JP 3-12, Cyberspace Operations*, dated February 2013 is quite old so for the purposes of this paper the 5 May 2017 (revisions in final coordination) version will be used as the changes are significant.

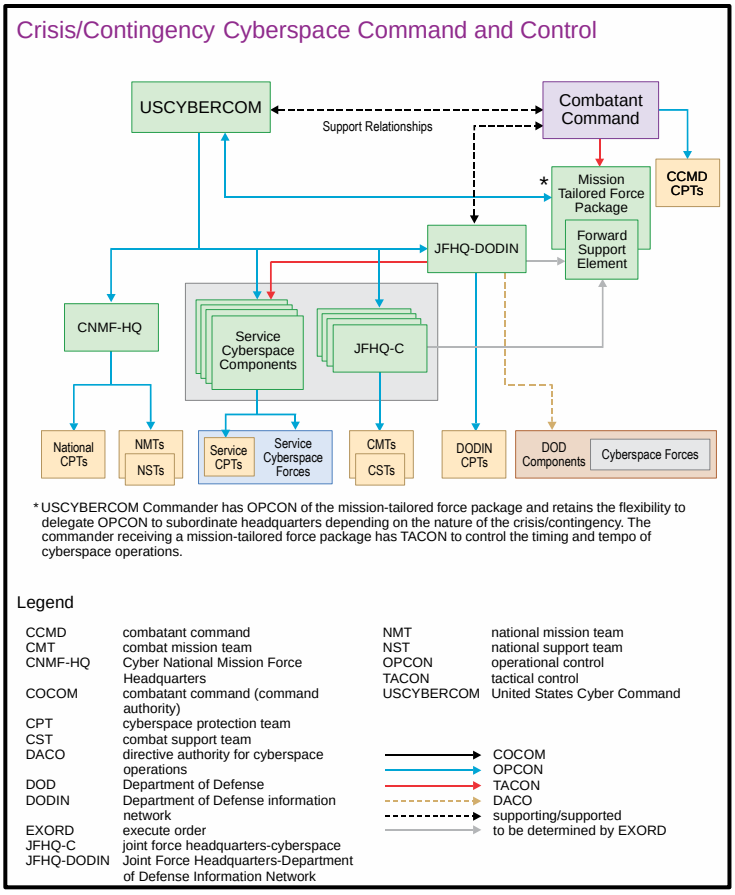


Figure 8 JP 3-12 Cyberspace C2 Structure

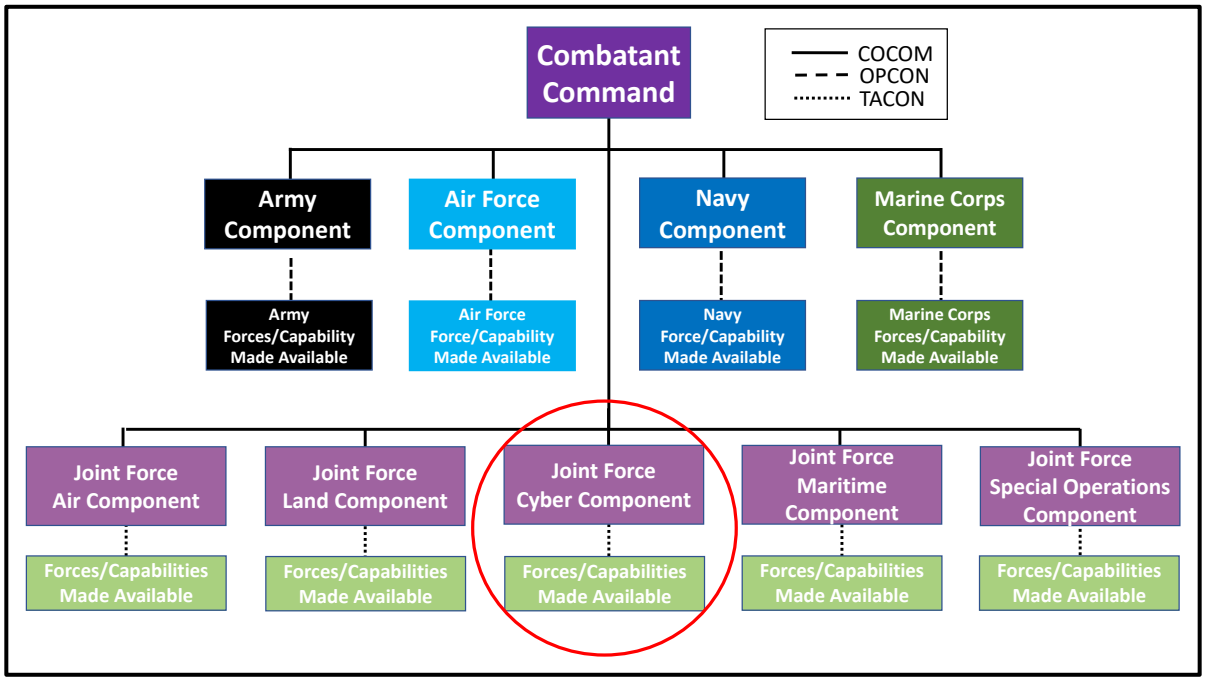
What both versions absolutely agree on is the need for CO to be integrated, synchronized, and deconflicted towards accomplishing the supported commander's objectives. The mechanism, though, is quite different. Much of the driving forces behind the publication changes is the elevation of USCYBERCOM from a sub-unified command under USSTRATCOM to the status

of an independent Unified Combatant Command.[96] As shown in Figure 8, the command relationships are more fully developed from the 2013 publication but are still lacking a vital piece to fully integrate CO into the warfighting structure used by the other domains. Under the current structure, COCOMs have TACON of cyber forces provided by USCYBERCOM through a Forward Support Element or a larger Mission Tailored Package Force based on contingency requirements. This is different than other domains since CCDRs usually exercise COCOM (of which OPCON is inherent) over all assigned forces. Even when pushing past the issues regarding unity of command, the CCDR must now direct tactical actions within a domain that is both extremely dynamic and incredibly technical. Much like the SHAEF in post-OVERLORD operations, there is added strain on a staff that is not properly equipped to maximize operations within the cyber domain. The end result is a lack of full integration.

Recommendations

Joint doctrine must dictate the requirement for a Joint Forces Cyber Component Commander (JFCCC) who is equal to the other functional component commanders (see Figure 9) and can quickly and efficiently integrate the cyber domain with the other four physical domains in pursuit of JFC objectives. Under the current structure, CYBERCOM has divided

Figure 9 Recommended FCC Structure



cyberspace operators into three primary operational forces. Joint Force Headquarters – Department of Defense Information Network (JFHQ-DODIN) is responsible for global DODIN operations and defense of the network. Commander, National Mission Force – Headquarters (CNMF – HQ) executes defensive response actions and, when directed, employs national level cyber protection teams (CPT) against threats to critical blue cyberspace outside the DODIN. Commanders, Joint Force Headquarters – Cyber (JFHQ-C) focuses on refining intelligence requirements, providing tactical expertise regarding feasibility of courses of action, and

integrating Offensive Cyber Operations (OCO) into CCDR plans and orders.[97] In practical terms, JFHQ-C is the "expeditionary" arm of USCYBERCOM and is of the most interest here since it supplies CCMDs with the majority of its offensive forces/capabilities.

Within the JFHQ-C, each service component is assigned to support specific CCMDs.[98] If one adheres to *JP 1* and what it says about embracing jointness as a "fundamental organizing construct at all echelons"[99] of the Armed Forces and that this jointness "implies cross-Service combination wherein the capability of the Joint Force is understood to be synergistic, with the sum greater that its parts;"[100] then it is only logical that the nation's cyber forces should not be constrained to operations only within their specific services and in support of specific CCMDs. While the cyber domain has characteristics that make it very unique, no other domain recommends a similar division of labor. *JP 3-0* is clear that a functional component commander's staff "should reflect the command's composition so the staff has the required expertise to help the commander effectively employ the component's forces."[101] Why should the cyber domain be any different? It is more logical and more closely adherent to current doctrine to designate a JFCCC who would act as the primary integration mechanism and execute TACON over the forces provided from the Service components via USCYBERCOM. Just like the other domains, the service with the preponderance of forces in that AO would likely be named the component commander.

It might be easy to say that the current COMREL structure is working and that sentiment may even be correct for the current state of conflict. Offensive cyber operations conducted during recent low intensity combat operations have the benefit of time on their side. The US is fighting an enemy who is decidedly less advanced in all the domains. Since cyberspace operations are new and their effects are difficult to decipher but can be wide-ranging, then it is

easier to understand why control of CO is held at very high echelons of command and also why designating a JFCCC might not be feasible. It is important, however, to plan for the next war and not just plan to fight the same war again. As the cyber domain expands and becomes more pervasive not only to civilian life but also to military operations, commanders must become more comfortable in delegating responsibility for CO down to lower echelons of command. The current command structure will be unable to keep pace with future operations conducted in the transregional, multi-domain, and multi-functional environment described in *JP 5-0*. A functional component commander provides the best means to operate in such an environment.

The Air Force, in its 2015 *Future Operating Concept*, has already suggested a reasonable mechanism to execute operational C2 in such a dynamic multi-domain environment. Multi-Doman Command and Control (MDC2) will be performed out of a future Multi-Domain Operations Center (MDOC) that is structured very much like the current AOC. Instead of the permanent, infrastructure intensive AOCs currently in use, MDOCs will contain the essential command elements and requisite authorities to be the operational headquarters for air, space, and cyberspace. MDOCs will be quickly repositioned and reconfigured while relying on geographically dispersed reach-back cells with globally networked capabilities.[102] Co-location of the JFACC and JFCCC would allow for better and more timely integration across all domains. The product of this enhanced integration would manifest itself through the Multi-Domain Tasking Order (MDTO), which is patterned off the Air Tasking Order (ATO). Some might argue that the idea the ATO is antiquated and that its 72-hour cycle cannot hope to keep pace with the tempo required of multi-domain operations; however, the doctrinal underpinnings of the ATO's linear approach – plan, task, execute, and assess – remain doctrinally sound.

Presently, the first common command authority for air, land, maritime, space, and cyber campaigns in the Secretary of Defense.[103] With this restriction in place, is the Joint Force really practicing unity of command and enabling the warfighter the essential characteristic of mission command? It is incorrect to believe that since the cyber domain feels so groundbreaking today, the doctrine and frameworks that govern current military capabilities simply do not apply to it. Cyber theorist Jon Lindsay states the enduring need for applicable doctrine: "Military history, in particular, is littered with arguments from technology that failed in experience: the stirrup will transform the feudal order; the tank will sweep away infantry; the bomber will zip through defenses to cripple the enemy; and sensor-to-shooter networks will make war quick and decisive. Almost every study of technology and war finds that doctrine, organization, and the circumstances of employment matter as much as, or more than, the characteristics of weapons for military performance."[104] Multi-Domain Battle is not a fleeting concept. The ability to effectively integrate and C2 emerging domains will become more important even as technology continues to develop at an incredible pace. The designation of a Joint Force Cyber Component Commander, rooted in the historical lessons learned from the integration of the air domain and the JFACC, will provide a much-needed doctrinal foundation upon which to increase cross-domain lethality.

Appendix A

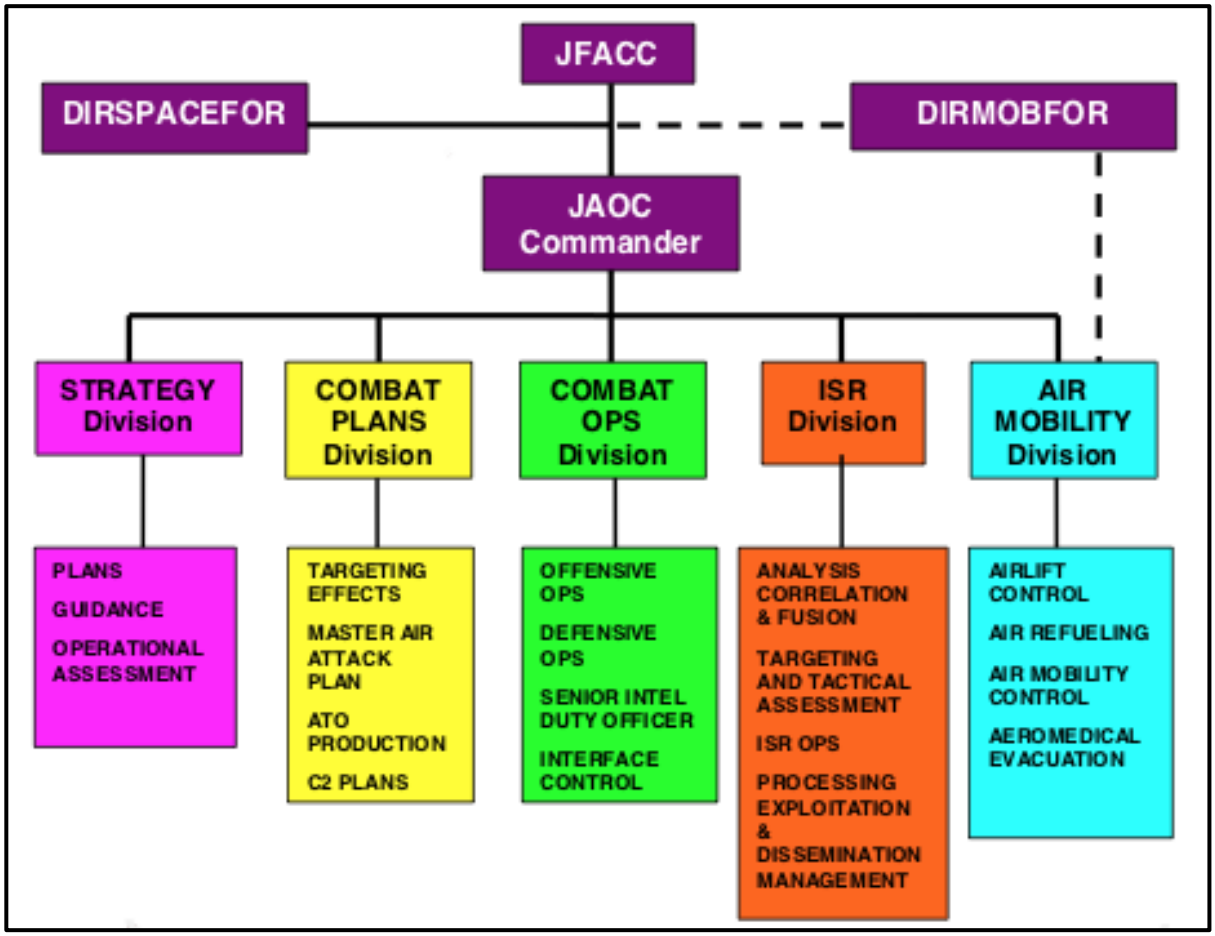
The Air Operations Center (AOC) provides operational level command and control of air and space forces to accomplish joint force commander objectives. Each AOC configures itself dependent upon the level and type of mission to integrate numerous disciplines in a cross-functional team approach to planning and execution. The AOC at its simplest form is a collection of people who plan and integrate air and space operations. Additionally, there is an associated technical component. In 2000, Air Force Chief of Staff Gen John Jumper designated the AOC a weapons system and the command center infrastructure was given the formal name of AN/USQ-163 Falconer in 2002. The system reached initial operating capability on June 13, 2005 when a fully functioning system was installed for CENTCOM operations.[105]

Geographic and functional AOCs are designed to support specific areas of responsibility or specialized missions. For example, the 603d AOC located at Rammstein Air Base, GE is the designated geographic AOC for EUCOM. Therefore, it is configured to C2 air and space power in support of EUCOM objectives. 3d Air Force is the Component – Numbered Air Force (C-NAF)[106] that supports the 603 AOC. The 3 AF/CC is the JFACC for EUCOM. The 618 AOC, located at Scott AFB, IL is the functional AOC that supports USTRANSCOM by providing centralized mission planning, C2, and operations support for the air mobility mission. The 618 AOC does not support just one geographic area. It is responsible for providing global airlift capabilities on a 24/7 basis. So, while each AOC has a unique mission and design, there are some general characteristics that are important to understand in order to conceptualize how a MDOC might operate.

Doctrinally, AOCs are broken into five divisions (see Figure 1) who interact continuously throughout the planning and execution process. The Strategy Division begins the 72-hour ATO

cycle by refining and disseminating JFACC strategy guidance through the Air Operations Directive (AOD). The Combat Plans Division (CPD) is responsible for near term planning (within 48 hours of execution) and produces the ATO and related documents that help give context to the ATO such as the Airspace Control Order (ACO), special instructions (SPINS),

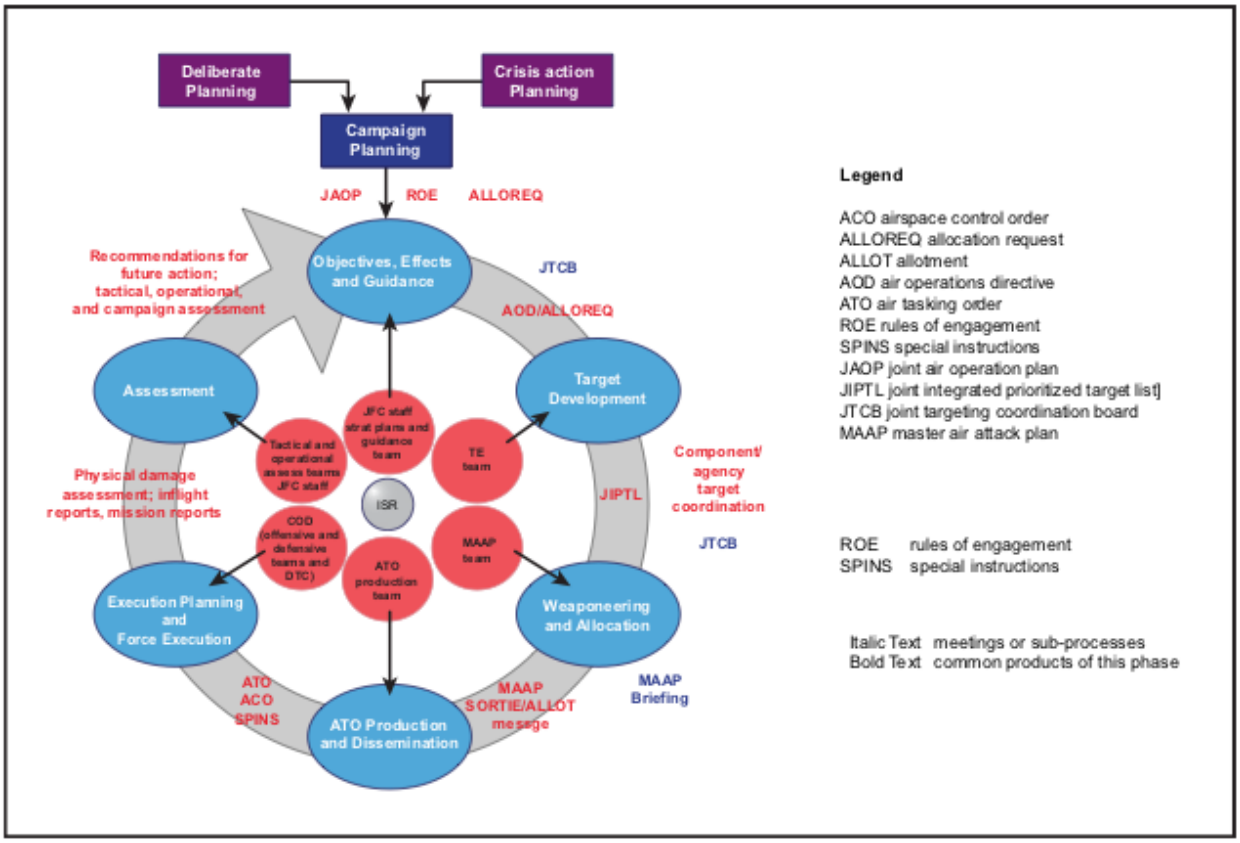
Figure 10 AOC Organization and Functional Teams[107]



and the joint integrated prioritized target list (JIPTL). The Combat Operations Division (COD) monitors and executes the current ATO. The Intelligence, Surveillance, and Reconnaissance (ISR) Division assessed and anticipates adversary activity, manages ISR operations, and develops targeting strategies. The Air Mobility Division (AMD) plans, coordinates, tasks, and executes the air mobility mission. Additionally, the director of mobility forces (DIRMOBFOR)

provides guidance to the AMD on behalf of the JFACC and exercises coordinating authority between the AOC, 618 AOC, and theatre deployment distribution operations centers to facility resolution of air mobility issues.[108]

Figure 11 Air Planning Cycle[109]



One of the key points when thinking about the integration of the cyber domain into the planning cycle (Figure 2) is the mechanics involved in the target development phase. To effectively employ cyberspace operations, it is essential that those capabilities integrate into the planning process. The Target Effects Team (TET) merges the Target Nomination Lists (TNL) from each of the components into a prioritized JIPTL via the joint targeting coordination board (JTCB) that goes to the JFC/JFACC for final approval. The JIPTL is pushed to the Master Air Attack Plan (MAAP) team to apportion the sorties to assets that have the capability to effectively strike that target. While the TET does have an Information Operations (IO) planner and a

Special Technical Operations (STO) planner, there is not a doctrinally designated cyber cell to integrate into the planning process. There is, however, an Information Operations/Non-Kinetic Operations Cell (IO/NKOC) located within the COD whose responsibility it is to synchronize employment of IO, EW, space, and cyberspace capabilities in support of kinetic operations.[110] The AOC's target development and weaponeering phase is a complex process but it absolutely requires more cyberspace operator involvement and additional integration via a JFCCC.

[1] JP 5-0, I-1.
[2] Samuel R. White Jr., ed, *Closer Than You Think: The Implications of the Third Offset Strategy for the U.S. Army*, (Carlisle Barracks, PA: Strategic Studies Institute and U.S. Army War College Press, 2017), 3.
[3] *Ibid*, 16.
[4] JP 3-0, IV-1.
[5] U.S. Army Training and Doctrine Command. *Multi-Domain Battle: Evolution of Combined Arms for the 21st Century, 2025-2040, Version 1.0*, December, 2017, 77.
[6] David G. Perkins, "Multi-Domain Battle: Driving Change to Win in the Future." *Military Review* 97, no. 4 (August 2017): 10.
[7] *Ibid*, 8.
[8] *Ibid.*
[9] *Ibid*, 11.
[10] David G. Perkins, "Preparing for the Fight Tonight: Multi-Domain Battle and Field Manual 3-0." *Military Review* 97, no. 5 (September 2017): 8.
[11] *Ibid*, 11.
[12] FM 3-0, 1-6.
[13] Perkins, "Preparing for the Fight Tonight", 11.
[14] Windows of domain superiority refers to the inability of the Joint Force to have superiority in all domains at all times. For example, air superiority has been a constant during the Global War on Terror, but this might not be the case in a conflict with a peer or near-pear adversary. Instead, the military might need to leverage cyberspace operations to degrade air defenses for a defined period that would then allow aircraft to shape the battlespace while Marine forces created a lodgment in a previously denied beach landing area.
[15] David G. Perkins, "Multi-Domain Battle: The Advent of Twenty-First Century War." *Military Review* 97, no. 6 (November 2017): 11.
[16] U.S. Army-Marine Corps White Paper. *Multi-Domain Battle: Combined Arms for the 21st Century*, 18 January, 2017, 4.
[17] Headquarters US Marine Corps, *Marine Operating Concept: How an Expeditionary Force Operates in the 21st Century* (Washington, DC: Headquarters US Marine Corps, September 2016), 20.
[18] *Ibid*, 21.
[19] U.S. Air Force, *Air Force Future Operating Concept*, September, 2015, 7.
[20] *Ibid*, 9.
[21] *Ibid*, 8.
[22] *Ibid*, 9.
[23] *Ibid*, 10.
[24] Williamson Murray, *War in the Air, 1914-45*, (The Cassell History of Warfare. London: Cassell, 1999), 27.
[25] John Howard Morrow, *The Great War in the Air: Military Aviation from 1909 to 1921*, (Smithsonian History of Aviation History. Washington: Smithsonian Institution Press, 1993), 72.
[26] *Ibid*, 73.
[27] *Ibid*, 283-284.

[28] Phillip S. Meilinger and Air University (U.S.) School of Advanced Airpower Studies, *The Paths of Heaven: The Evolution of Airpower Theory* (Maxwell AFB, Ala.: Air University Press, 1997), 90.
[29] *Ibid*, 225.
[30] David E. Johnson, *Fast Tanks and Heavy Bombers: Innovation in the U.S. Army, 1917-1945*. (Cornell Studies in Security Affairs. Ithaca: Cornell University Press, 1998), 155.
[31] Paths of heaven, 95
[32] John K. McMullen, and Air University: School of Advanced Airpower Studies, *The United States Strategic Bombing Survey and Air Force Doctrine* (Maxwell AFB, Ala.: School of Advanced Airpower Studies, 2001), 8.
[33] Johnson, *Fast Tanks and Heavy Bombers: Innovation in the U.S. Army, 1917-1945,* 161.
[34] Ken Steadman and Combat Studies Institute (U.S.), *A Comparative Look at Air-Ground Support Doctrine and Practice in World War II: With an Appendix on Current Soviet Close Air Support Doctrine* (CSI Report, No. 2. Fort Leavenworth, Kan.: Combat Studies Institute, U.S. Army Command and General Staff College, 1982), 8-10.
[35] William W. Momyer, A. J. C Lavalle, and United States Air Force, *Air Power in Three Wars [WWII, Korea, Vietnam]*, (Washington: Dept. of Defense, Dept. of the Air Force, 1978), 50.
[36] *Ibid, 41*.
[37] George F. Howe, and Center of Military History, *Northwest Africa: Seizing the Initiative in the West* (Cmh Pub, 6-1-1. Washington, D.C.: Center of Military History, U.S. Army, 1993), 486; Aircraft types sourced from, Eduard Maximilian Mark, *Aerial Interdiction: Air Power and the Land Battle in Three American Wars,* (Special Studies. Washington, D.C.: Center for Air Force History, 1994), 34-35.
[38] Momyer, *Air Power in Three Wars*, 49.
[39] *Ibid.*
[40] *Ibid*, 51.
[41] Stephen J. McNamara, and Air University (U.S.). Press, *Air Power's Gordian Knot: Centralized Versus Organic Control*, (Maxwell Air Force Base, Ala.: Air University Press, 1994), 31.
[42] *Ibid*, 53-54.
[43] Robert Frank Futrell and United States Air Force Office of Air Force History, *The United States Air Force in Korea, 1950-1953*, (Rev. Ed. ed. Washington, D.C.: Office of Air Force History, United States Air Force, 1991), 50.
[44] *Ibid*, 51.
[45] *Ibid*, 52.
[46] Momyer, *Air Power in Three Wars*, 54.
[47] Conrad C. Crane, *American Airpower Strategy in Korea, 1950-1953*, (Modern War Studies. Lawrence, KS: University Press of Kansas, 2000), 28.
[48] *Ibid*, 29.
[49] *Ibid*, 110.
[50] Futrell, *The United States Air Force in Korea*, 49.
[51] *Ibid*.
[52] Momyer, *Air Power in Three Wars*, 257-258.
[53] Futrell, *The United States Air Force in Korea*, 456-457.
[54] Momyer, *Airpower in Three Wars*, 61.

[55] Robert Frank Futrell and Martin Blumenson, *The Advisory Years to 1965*. The United States Air Force in Southeast Asia (Washington, D.C.: Office of Air Force History, United States Air Force, 1981), 207.
[56] *Ibid*, 102.
[57] Ian Horwood, *Interservice Rivalry and Airpower in the Vietnam War* (Fort Leavenworth, Kan.: Combat Studies Institute Press, 2006), 68.
[58] Momyer, *Air Power in Three Wars*, 71-72.
[59] Futrell, *The Advisory Years to 1965*, 100.
[60] Interestingly, current doctrine has repurposed the TACS acronym as the **Theatre** Air Control System, of which the AOC is the senior Command and Control Element that the JFACC uses to integrate the air domain.
[61] Momyer, *Air Power in Three Wars*, 73-74.
[62] The idea of Marine OPCON over Marine aviation assets and providing "surplus" sorties to the air component commander is interesting in that this specific verbiage is contained within numerous current doctrinal pubs to include Marine Corps Reference Publications, Joint Publications, and Air Force doctrine.
[63] Horwood, *Interservice Rivalry and Airpower*, 85-86.
[64] The Air Force was assigned route packages I, V, and VIA which held the larger amount of territory and was not along the coastline (except for route package I). The Navy serviced route packages II, III, IV, and VIB which all bordered the coast and were within range of aircraft carriers operating in the Gulf of Tonkin. See Figure 5, sourced from: Momyer, *Air Power in Three Wars*, 94.
[65] Momyer, *Air Power in Three Wars*, 95.
[66] McNamara, *Air Power's Gordian Knot,* 121-122.
[67] Much of this work was done via the AirLand Battle concept which was a joint post-Vietnam venture between the Army Training and Doctrine Command and the Air Force Tactical Air Command on the best way to integrate air and ground forces during major theatre war.
[68] Operation EAGLE CLAW was an attempt to end the Iran hostage crisis through the rescue of the 52 embassy staffers being held in Tehran. The rescue team was comprised of operators from all the services. Interoperability issues plagued the team from the start. The operation was eventually aborted due to maintenance issues. During the exfil process, a helicopter crashed into a transport, killing 8 servicemen and destroying both aircraft
[69] Edward C Mann and Air University (U.S.). Press, *Thunder and Lightning: Desert Storm and the Airpower Debates*, (Maxwell Air Force Base, Ala.: Air University Press, 1995), 55.
[70] Current joint doctrine does not mandate domain-specific component commanders either, but it provides many compelling reasons to do so.
[71] JFACC is synonymous with Combined Force Air Component Commander (CFACC). CFACC is used to describe a coalition (combined) environment. While the Gulf War certainly utilized a coalition, much of the literature uses JFACC so I will continue to use that term simply for ease of use.
[72] Diane T. Putney, *Airpower Advantage: Planning the Gulf War Air Campaign, 1989-1991*. The USAF in the Persian Gulf War. Washington, (D.C.: Air Force History and Museums Program, United States Air Force, 2004), 4.
[73] *Ibid*, 5-6.
[74] James P. Coyne, *Airpower in the Gulf*, (Arlington, Va.: Aerospace Education Foundation, 1992), 157.

[75] Mann, *Thunder and Lightning*, 59.
[76] *Ibid*, 58.
[77] *Ibid.*
[78] Michael R. Gordon and Bernard E Trainor, *The Generals' War: The Inside Story of the Conflict in the Gulf*, (1st Ed. Boston: Little, Brown, 1995), 320.
[79] *Ibid*, 320.
[80] *Ibid*, 330.
[81] *Ibid*, 320.
[82] McNamara, *Air Power's Gordian Knot,* 127.
[83] Eliot A. Cohen, Gulf War Air Power Survey (Organization: U.S.), and United States. Department of the Air Force, *Gulf War Air Power Survey Vol. I*, (Washington, D.C.: Office of the Secretary of the Air Force, 1993), 51.
[84] Gordon and Trainor, *The General's War*, 311.
[85] Coyne, *Airpower in the Gulf*, 190.
[86] Putney, *Airpower Advantage*, 362.
[87] Cohen, *Gulf War Air Power Survey Vol. I*, 216-218.
[88] Grover E. Myers and Air University (U.S.). Center for Aerospace Doctrine, Research, and Education, *Aerospace Power: The Case for Indivisible Application*, (Maxwell Air Force Base, Ala.: Air University Press, 1986), 59.
[89] JP 1, IV-17.
[90] JP 3-30, *Command and Control for Joint Air Operations*; JP 3-31, *Command and Control for Joint Land Operations*; JP 3-32, *Command and Control for Joint Maritime Operations*
[91] JP 3-14, III-1.
[92] JP 3-14, IV-3.
[93] JP 3-14, III-2.
[94] JP 3-14, IV-4.
[95] See Appendix A for an explanation on the AOC structure and its associated targeting process.
[96] US President, Statement on the Elevation of Cyber Command. https://www.whitehouse.gov/briefings-statements/statement-president-donald-j-trump-elevation-cyber-command/
[97] JP 3-12, 42.
[98] The Marines (MARFORCYBER) support USSOCOM. The Army (ARCYBER) supports USCENTCOM, USAFRICOM, and USNORTHCOM. The Navy (FLEET CYBER) supports USPACOM and USSOUTHCOM. The Air Force (AFCYBER) supports USEUCOM, USSTRATCOM, and USTRANSCOM.
[99] JP 1, I-2.
[100] JP 1, I-2.
[101] JP 3-0, IV-7.
[102] Air Force Future Operating Concept, 14.
[103] Chief of Staff of the Air Force, *CSAF Focus Area Multi-Domain Command and Control Project Plan*, (Draft, 30 December, 2016), 9.
[104] Jon R. Lindsay and Lucas Kello, "Correspondence: A Cyber Disagreement." *International Security* 39, no. 2 (2014): 182.
[105] Cynthia Di Pasquale, "Falconer Achieves Initial Operating Capability with Two AOCs," *Inside the Air Force*, July 8, 2005. www.lexisnexis.com/hottopics/lnacademic

[106] See Section 2.2 of AFI 13-1 AOC V3 for more information on Component – Headquarters Organizations.
[107] AFI 13-1 AOC V3, 13.
[108] AFTTP 3-3.AOC, 7-1.
[109] AFTTP 3-3.AOC, 6-2.
[110] AFTTP 3-3.AOC, 5-65.

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