

ADEQUACY OF AIRBASE OPENING OPERATIONS DOCTRINE

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General Studies

by

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ABSTRACT

ADEQUACY OF AIRBASE OPENING OPERATIONS DOCTRINE, by MAJ James E. Long, 120 pages.

This thesis provides a look at the issue of airbase opening operations in the post 11 September environment of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). During the Global War on Terrorism, the need to establish and operate joint airbases has never been greater. The Air Force Institute of National Security Studies identified the topic as a priority one topic for fiscal year 2006. The problem was whether the doctrine airbase opening doctrine in effect during OEF and initial OIF operations were comprehensive to ensure successful future joint operations. To address the problem the thesis analyzes base operating support, airfield operations, airbase ground defense, and communications utilizing doctrine and case study information. Joint doctrine provided little guidance regarding joint airbase opening operations. This can cause a number of problems regarding joint airbase operations command and control, facility utilization, and airfield transition to civilian use. The thesis provides a detailed look at twenty-two joint doctrine publications that include provisions relevant to airfield operations. It provides a thorough case study of OEF and OIF airbase opening operations. The combination of the case study and doctrine analysis provide the justification that there needs to be new doctrine on joint airbase operations.

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TABLE OF CONTENTS

	Page
MASTER OF MILITARY ART AND SCIENCE THESIS APPROVAL PAGE	ii
ABSTRACT	iii
ACKNOWLEDGMENTS	iv
ACRONYMS	vii
ILLUSTRATIONS	ix
TABLES	x
CHAPTER 1. INTRODUCTION	1
Introduction	1
Purpose	2
Research Question	2
Background and Significance	2
Assumptions	3
Delimitations	4
Limitations	5
The Research Material	5
The Research Method	6
Definitions	8
CHAPTER 2. REVIEW OF LITERATURE	10
Introduction	10
Chapter 2 Organization	10
An Expeditionary Air Force	11
Air Force Contingency Response Group	22
Look at Overarching Doctrine	25
Other Relevant Documents	32
Conclusion	38
CHAPTER 3. THE RESEARCH METHOD	43
CHAPTER 4. ANALYSIS	49
Introduction	49
Successful Air Base Opening Operations	50
Evaluation of Doctrine	53

Existing DoD Doctrine	53
Base Operating Support	56
Airfield	63
Security	66
Communications	73
Base Operating Support, Senior Airfield Authority, Air Base Ground Defense	
Doctrine	75
Tactics, Techniques, and Procedures on Airbase Opening Operations	77
Case Studies	77
Single Service Airbase Opening Operations	78
Joint Airbase Opening Operations	81
Airbase Opening Doctrine and Its Use in OEF and OIF	91
CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS	95
Introduction	95
Interpretation of Findings	97
Recommendations	99
Conclusions	100
APPENDIX A. AIRBASE OPENING OPERATIONS DOCTRINE REVIEW	
WORKSHEET	102
BIBLIOGRAPHY	103
INITIAL DISTRIBUTION LIST	107
CERTIFICATION FOR MMAS DISTRIBUTION STATEMENT	108

ACRONYMS

ACS	Agile Combat Support
AF	Air Force
AFDD	Air Force Doctrine Document
AOR	Area of Responsibility
BDOC	Base Defense Operations Center
BEEF	Base Engineer Emergency Force
BOS	Base Operating Support
BOS-I	Base Operating Support Integrator
CALL	Center for Army Lessons Learned
CENTCOM	Central Command
CONOPS	Concept of Operations
CRG	Contingency Response Group
DoD	Department of Defense
EAF	Expeditionary Aerospace Force
ECS	Expeditionary Combat Support
EOD	Explosive Ordnance Disposal
FM	Field Manual
GWOT	Global War on Terrorism
JFC	Joint Forces Commander
JFUB	Joint Facilities Utilization Board
JP	Joint Publication
JRA	Joint Rear Area
JRAC	Joint Rear Area Coordinator

JRSOI	Joint Reception, Staging, Onward Movement, and Integration
JTF	Joint Task Force
MHE	Materials Handling Equipment
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
NEO	Noncombatant Evacuation Operation
RED HORSE	Rapid Engineer Deployable Heavy Operational Repair Squadron
RQS	Rescue Squadron
SAA	Senior Airfield Authority
SOF	Special Operations Forces
TTP	Tactics, Techniques, and Procedures
US	United States
USAAF	United States Army Air Forces

ILLUSTRATIONS

	Page
Figure 1. CENTAF Aircraft Beddown at End of Phase 1	22
Figure 2. CENTCOM BOS-I/SAA Matrix.....	35
Figure 3. Agile Combat Support Overview.....	62

TABLES

	Page
Table 1. Doctrine Analysis Matrix.....	45
Table 2. Joint Publications Analysis Summary	54

CHAPTER 1

INTRODUCTION

The two hardest things we do . . . is to fly and fix airplanes.¹

Gen John Jumper, CSAF

Introduction

The above quotation from the US Air Force Chief of Staff describes the primary challenges of the United States Air Force which include the key aspects of airbase opening operations. Since the attacks on 11 September 2001 and the resulting Global War on Terrorism (GWOT), the need to establish airbases in close proximity of ground operations has increased dramatically. The first occurrence was in Afghanistan, a land locked nation, and then again in Iraq as demonstrated at Tallil Air Base among other locations. The need to effectively seize, open, and operate airbases is a key to providing close air support and airlift support in the superior manner required in today's contemporary operating environment. With recent experience in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), it is timely to evaluate whether doctrine is sufficient to ensure successful future joint operations. To determine the sufficiency of current doctrine a number of secondary issues must be addressed as well. This thesis includes the examination of doctrine relating to airbase opening operations and how the transitions between seizure and airbase operations are impacted. It does not focus on the initial seizing of the airfield or permanently operating bases but does look at the airbase planning prior to airfield seizures. The thesis topic is timely during the GWOT as the United States has operations across the world on airfields in operational environments that range from permissive to unknown to hostile.

Purpose

The purpose of this thesis is to improve airbase opening operations which in turn will improve the ability of the United States Air Force to rapidly and efficiently provide airpower to the Joint Forces Commander in areas of operations worldwide.

Research Question

The primary research question of this thesis is: Was the doctrine airbase opening doctrine in effect during Operation Enduring Freedom and initial Operation Iraqi Freedom operations comprehensive to ensure successful future joint operations?

To answer the primary question a number of secondary questions must be answered. First, what doctrine on airbase opening operations exists in the Department of Defense (DoD)? Second, what airbase opening operations procedures were used during OEF and OIF? Third, did the US military deviate from existing doctrine regarding airbase opening operations during OEF and OIF? Fourth, do case studies of US airbase opening operations provide pertinent lessons learned? Fifth, what makes an airbase opening operation a success? Sixth, is Base Operating Support (BOS), Senior Airfield Authority (SAA), and Airbase ground defense doctrine and guidance sufficient? Lastly, do any gaps exist in tactics, techniques, and procedures (TTPs) regarding airbase openings?

Background and Significance

The completion of this thesis provides the United States military community a strong foundation so that necessary updates to airbase opening operations doctrine, both joint and service specific, can be implemented. While the thesis does address individual services, its focus will be on joint operations and seams between uses of the airfields. The

United States Air Force Doctrine Center identified the overall topic of airbase opening to the Air Force Institute of National Security Studies as a priority one topic for fiscal year 2006. In addition, the Air Force Doctrine Center identified the issue to the joint doctrine community as an open item requiring resolution. The thesis provides the joint doctrine community key information regarding airbase opening. It also provides operational units with detailed analysis of past events and provides recommendations on areas of improvements they can make that enhance United States Air Force airbase operations in the ever increasingly joint environment. The current operating environment that the joint forces are facing is very dynamic and complex. The ability of the Air Force to operate at the highest level is tough work and requires Airman at all levels to understand their role using thorough doctrine and executable TTPs.

Assumptions

The first assumption is that the case study data available during the thesis process was enough to conduct accurate analysis, draw appropriate conclusions, and make vital recommendations. Second, it is assumed that the discussion on airbase opening operations is still relevant and not closed as a subject of interest. This is based on the fact that the topic is still listed as a priority one area of interest for the Air Force Institute of National Security Studies. Third assumption, the runway sufficiency portion of airbase opening has been exhaustively researched. This is based on the literature review which revealed many studies that evaluate the many aspects of runway assessment and repair. Fourth, it is assumed that the data gathered during the case studies portion of research will be a fair assessment based on the individual's involvement and scope of

responsibility. Interview questions and thorough follow-up ensured that the information found was framed in the proper context of the individual(s) providing the data.

Delimitations

This study contains a number of delimitations due to the broad scope of airbase opening operations. First, runway sufficiency issues relating to airbase opening are not evaluated. This includes runway assessment, runway repair, and other related issues. The reason for excluding runway sufficiency is based on the large amount of research done in the past five years on that subject. Second, issues relating to airspace control were not investigated. This includes initial airspace control utilized when opening an airbase and the equipment required for long term airspace control. The reason for excluding this from the study is to keep the focus of the thesis on airbase activities on the ground not related to controlling aircraft taxi and flying operations. Initial airfield seizure activities and permanent operating bases are not within the scope of this thesis; however, planning of airbase openings is addressed. This thesis examines the Base Operating Support (BOS) and logistics aspects of airbase opening operations. It examines airfield authority issues with particular attention given to joint operating bases. The thesis addresses the transitions between the different phases in airbase opening for elements that help answer the secondary research questions. The thesis also addressed airbase ground defense within the context of joint operating base security doctrine. This thesis focuses on doctrine officially approved by 31 December 2005. Emerging doctrine directly relating to airbase opening operations was evaluated if possible.

Limitations

The limitations on this study are related to information access, and funds to study the subject. Information access is a limitation primarily from the need to keep the thesis unclassified which exempts some case study material that is currently classified. Funds were applied for from the AF Institute of National Strategic Studies, but due to the lack of an approved appropriations bill, no money has been distributed by AF Institute of National Strategic Studies. This changed the primary method of gathering case study data from interviews in person to primarily information gathered through email and phone conversations which made it more of a challenge to properly gather and characterize the information gathered. The only limitation based on the researcher is that as an Air Force officer the possibility that a bias exists when evaluating data gathered through the research process. This was mitigated through the use of my thesis committee, which include Army, Navy, and Air Force officers, and their review of each chapter during the thesis completion. This in effect was a type of investigator triangulation.

The Research Material

The sources of material for use in this thesis are professional articles, lessons learned information, existing doctrine, and military individuals involved with airbase opening operations. Events since 11 September 2001, principally OEF and OIF, have generated much discussion and even some published articles on the subject matter. However, there are not any publications which address whether the existing doctrine was followed and whether it was sufficient. They primarily point out that airbase opening is important in today's contemporary operating environment. There are a number of sources which provide broad background information on how and why the US Air Force has seen

it important to focus on airbase opening activities. The research material available can be broken down into four categories: professional articles, existing guidance (doctrine, CONOPS, and regulations), existing case studies--lessons learned and information that can be learned from first-hand accounts of those who participated in airbase opening operations.

Material which describes in detail airbase operations provides a look at the specific areas of improvements and identifies the areas that work extremely well are of great interest. Any documents that detail the relationship between services at a joint operating base are also of interest. The compilation of research material provided the researcher with the foundation of understanding of what has been done, as well as, provided the data required to complete the thesis utilizing the research method described.

The Research Method

The purpose of the research method is to analyze the research material gathered for the purpose to answer secondary questions which in turn led to the answer of the primary research question. The method is detailed in chapter 3 but overall the method will consist of the following: literature review, doctrine review, review existing case studies, conduct interviews, and finally analyze the data collected.

The research focused on these areas: established doctrine, draft doctrine, other existing guidance, and case studies through articles, lessons learned, and interviews. First, the existing doctrine was searched. This research included joint and individual service doctrine. Then the existing regulations and guidance in the services and combatant commands relating to airbase opening operations was searched. With the groundwork done, the research moved into case studies.

The second research area explored was case studies. The foundation of the case studies was established in the literature review section which describes airbase operations as documented in history. The case studies focused on Operation Enduring Freedom and Operation Iraqi Freedom with data from other operations as appropriate. The case studies show the success of single service operations in Operations Enduring Freedom and Iraqi Freedom using data from multiple operations. These major operations are supplemented with information about smaller contingencies conducted across the world. After setting the stage with single stage operations, the thesis explores joint operations in Operation Enduring Freedom and Operation Iraqi Freedom. This included interviews with individuals involved with airbase opening operations. To round out the data required to properly examine both contingencies, documentation of lessons learned and articles or reports on base operations are reviewed for this thesis.

Once the doctrine and case study research was complete, the thesis evaluated both the doctrine and case studies against the criteria established for evaluating the doctrine and the case studies. These criteria were based on the US Central Command (CENTCOM) Base Operating Support-Integrator (BOS-I) and Senior Airfield Authority (SAA) responsibility matrix which CENTCOM uses throughout its area of responsibility to delineate by service the BOS-I and SAA responsibilities. Evaluating both the case study and doctrine using the established criteria provided a thorough body of data to evaluate the primary and secondary research questions noted earlier in this chapter. The data collected provided the basis of the conclusions and recommendations found in chapter 5.

Definitions

Airbase Opening. Setting up initial operations at an airfield either taken by force or provided by host nation for use by joint or coalition forces.²

Airfield. is an area prepared for the accommodation (including any buildings, installations, and equipment), landing, and takeoff of aircraft.³

Beddown (force beddown). The provision of expedient facilities for troop support to provide a platform for the projection of force.⁴

Base Operating Support. Those services needed to provide for the daily operations of the air base not directly related to airfield operations.⁵

Base Operating Support-Integrator. Acts on behalf of all forces and services on the camp. Coordinates contracting support and the efficient use of mission support resources. Provides master planning for facilities and real estate. Responsibilities include collecting and prioritizing construction requirements and seeking funding support, environmental management and hazardous waste disposal.⁶

Doctrine. Are 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.⁷

Forward Operating Base. An airfield used to support tactical operations without establishing full support facilities. The base may be used for an extended time period. Support by a main operating base will be required to provide backup support for a forward operating base.⁸

Main Operating Base. Base established by a joint force special operations component commander or a subordinate special operations component commander in

friendly territory to provide sustained command and control, administration, and logistical support to special operations activities in designated areas.⁹ Alternate meaning is a permanent base with combat forces and robust infrastructure intended to support training, security cooperation, deployment and employment operations.¹⁰

Senior Airfield Authority (SAA). Integrates and deconflicts joint airbase operations; exercising authority over the operation and maintenance of the airfield and associated facilities.¹¹

¹Gen John J. Jumper, *Chief of Staff Sight Picture: Combat Wing Organization* (Washington, DC: AF News, July 2002).

²For the purpose of this thesis, this term has been operationally defined to reflect the researcher's meaning

³Chairman of the Joint Chiefs of Staff, JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, (Washington, DC: Government Printing Office, 20 March 2006), 19.

⁴*Ibid.*, 213.

⁵For the purpose of this thesis, this term has been operationally defined to reflect the researcher's meaning

⁶United States Central Command, R415-1, *Construction and Base Camp Development in the USCENTCOM Area of Responsibility (AOR)*, "The Sand Book," (Washington, DC: Government Printing Office, 20 March 2006), 19.

⁷Chairman of the Joint Chiefs of Staff, JP 1-02, 166.

⁸*Ibid.*, 214.

⁹*Ibid.*, 316.

¹⁰United States Central Command, R415-1, 13.

¹¹*Ibid.*

CHAPTER 2

REVIEW OF LITERATURE

LAND POWER AND AIR POWER ARE CO-EQUAL AND INTERDEPENDENT FORCES; NEITHER IS AN AUXILIARY OF THE OTHER.¹

War Department, Field Manual 100-20, 1943

Introduction

With recent experience in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), it is timely to evaluate whether doctrine is sufficient to ensure successful future joint operations. This thesis examines adequacy doctrine regarding airbase opening operations. The thesis topic is key during the Global War on Terror (GWOT) as the United States has operations across the world on airfields in operational environments that range from permissive to unknown to hostile. The purpose of this thesis is to improve airbase opening operations which, in turn, will improve the ability of the US Air Force to rapidly and efficiently provide airpower to the Joint Forces Commander in Area of Operations worldwide. The topic of doctrine and airbase opening has not been studied in depth. However, there are a number of articles and information available on components that make up airbase opening.

Chapter 2 Organization

Chapter 2, “Review of Literature,” is organized in a way that explains the expeditionary nature of Air Force operations, including the limited documented history of airbase opening operations, followed by a discussion on contingency response groups, a look at overarching doctrine and finally other relevant documents. The history of airbase

opening operations looks primarily at the time since the beginning of World War II through Operation Allied Force in 1999. The exploration into the expeditionary nature of Air Force operations starts with the first use of airpower in combat in US history. The discussion on Contingency Response Groups includes a look at how they originated, were tested, implemented as well as their results. The doctrine piece of the literary review is focused on the overarching guidance on airbase opening operations in joint publications (JPs) (e.g., JP 3-0, 4-0, 5-0), overarching service doctrine (e.g., FM 3-0, FM 4-0, AFDD 1-1, and AFDD 2-4). The other relevant documentation included in the review of literature includes other pertinent research, information from combatant commands, and lessons learned data. By attacking the review of literature in the manner described above, this chapter adequately describes the past and the near present of airbase opening operations and overarching doctrine. This provides a solid foundation for the research described in chapter 3 and results listed in chapter 4.

An Expeditionary Air Force

The United States Air Force's roots are expeditionary in nature. That can be traced to the very beginnings of the use of Airpower on the battlefield. The word expeditionary means "meant for use abroad" or out of one's own country.² This is expounded on by AFDD 1-1, which, points out that the US Air Force has transformed from a forward deployed in-garrison force trained for one primary mission with one adversary, the Soviet Union, into a flexible force responding to a number of missions worldwide.³

The first combat employment of US airpower was expeditionary in nature. In 1916, the 1st Aero Squadron based out of Fort Sam Houston, San Antonio, Texas, was

deployed to support the Mexican Punitive Operations against General Pancho Villa in northern Mexico. The aircraft deployed forward in April 1916 and conducted reconnaissance operations until May 1916 when the last of its eight aircraft had crashed.⁴ There were two lessons learned from the first expeditionary airpower operations. First, the design of the aircraft needed to be improved. Second and more germane to support operations, there was inadequate planning within the logistical realm of airpower employment.

After that test of US airpower, the US entered World War I and again airpower showed its natural attraction to expeditionary operations. Primarily due to the range of fighter aircraft, the Aero Squadrons were required to set up operations almost anywhere. The prevailing mindset was that almost any field will do. This was exemplified by the fact that aircraft had mud guards over the tires. This truly meets the meaning of expeditionary operations. General Pershing recognized the need to properly support the expeditionary forces deployed to fight and created advanced depots to provide support.⁵

During World War I, airfield opening operations had no unique qualities that have been detailed in composite logistics history books to date. The primary reason for this is that the aircraft just needed a field. Due to the limited range of the aircraft, they were based as forward based as possible. This forward basing enabled Aero Squadrons to fall under the system of base, intermediate, and advance depots that General Pershing put in place to support all of the American forces.⁶

The expeditionary nature of airpower operations were greatly expanded in World War II. There are a number of reasons for this expansion. First, a number of technological advances were made during the interwar period which made airpower more decisive in

combat operations as the Germans showed before the US entered the war. Second, the value of air transportation of service members and supplies was recognized and implemented through the Air Transport Command.⁷ This resulted in increased expeditionary operations such as airborne drops across the world and aerial resupply of troops. Finally, the global nature of the war required US airpower to be employed in environments ranging from the desert of North Africa to the jungles of China to the islands throughout the Pacific. World War II was the capstone expeditionary event of airpower's first fifty years of development and employment.

Airbase opening happened at the highest rate ever in the history of US airpower during World War II. Airfields were opened from the fields of England to the volcanic islands of the South Pacific to the jungles of China. Each theater provided its own challenges, requirements, and foci for those conducting airbase opening. In the European theater, the initial focus of airbase opening, of course, was the United Kingdom. The US Air Corps leadership, after evaluating operations of the Royal Air Force, determined that the US Air Corps needed its own men and equipment to build and open airbases in forward areas.⁸ Four Army Air Force bases were even opened in Russia. In the United Kingdom, over 140 airfields were constructed or improved so that the United States Army Air Forces (USAAF) could use them.⁹ This effort started out with a battalion sized USAAF unit and by the peak in 1945, the unit was its own command with 117,000 men. USAAF leaders decided to build airbases large enough to accommodate an entire group, instead of just one squadron as the Royal Air Force (RAF) did.¹⁰ This was due to the rapid build up and utilization of airpower in the combined bomber offensive. Combined operations which are so common in today's operating environment even existed in the

early stages of World War II when USAAF aircraft used RAF bases on a joint basis with RAF units. The range of airfields that were opened in the United Kingdom ranged from robust airfields in great shape to airfields that only had a grass strip improved with steel planking. Facilities used by support personnel ranged from existing machine shops to tents erected by USAAF troops.¹¹ The conditions experienced by USAAF in UK were superb when compared to those in the rest of the European Theater to include North Africa, Italy, and eventually France after D-Day.

In North Africa, four battalions deemed the best USAAF airfield opening units in England were chosen to accompany the first US assault forces in North Africa. Initially, there were difficulties over the command of the forces designated to open airfields but USAAF ownership of the troops became established quickly. The initial airfield opening operations in North Africa identified issues that needed to be solved and became an example that the officers sought to avoid in the future. There are stories upon stories of heroic technical feats, such as turning dusty ground into operating airfields, rebuilding seized airfields, and overcoming the tough North African weather, that ensured the ability for airpower to be used at will. By the end of the North Africa campaign, over 125 airfields were built or improved upon by American and British forces for an average of one new airfield every 2 days.¹² General Spaatz sent a letter containing praise for those responsible for opening airbases. He described them “as nearly indispensable to the AAF as is possible to ascribe to any single branch thereof.”¹³

The campaigns into the mainland of Europe first in Italy and eventually in France achieved many similar results to those activities in North Africa. USAAF troops learned well the lessons of North Africa and applied them with excellence on the mainland.

However, there are a number of cases where those that were going to open airfields immediately after reaching the mainland were not included in the planning that led up to the operations. The lesson learned of including aircraft basing in operational planning is even more important in today's operating environment considering the critical nature of airpower to today's successful joint operations. Their utilization was noted to be key when determining what existing airfields to seize from the enemy and what areas were best suited to be turned into airfields. Those opening the airfields frequently found themselves in the initial amphibious landings beginning the process of assessing and either constructing or improving airfields that were key to resupply operations and casualty evacuations. A good example of this was the rapid building of an airfield in vicinity of Omaha beach. This was the first American airfield in France with air traffic at the rate of 100 C-47s a day for the first six weeks.¹⁴ The task of opening airfields frequently required the use of host nation personnel to do such tasks as filling in bomb craters. The normal pattern was for airbase opening to occur as close to the forward line of troops as possible to serve a tactical air or bomber wing. Once the front moved, the pattern would be repeated keeping airpower support as strong as possible. Allied forces built or repaired 240 airfields in less than one year after D-Day.¹⁵ This feat was a key to the success of allied operations in Europe. In the Pacific, some of the issues and experiences were the same, but differences existed and key lessons were learned during airfield opening operations.

There were two major differences between the Pacific theater and the European theater. The first was the relative logistical development of the area of operations. The second was the command structure of those opening airfields. The difference between the

logistics lines of communications in the southwest Pacific theater and those in European theater was night and day. The European theater was “modern,” even North Africa had some European influence. However, in the Pacific, almost every location had nothing. There were neither docks nor roads, just paths used by mule pack. There were no real towns, just some grass buildings sporadically dispersed on each island. From the airbase opening perspective, dealing with the environment of the Pacific was a bigger challenge than the enemy. The combination of the lack of roads and docks with the heat, insects, and disease had a large impact on airbase opening operations in the Pacific.¹⁶ The second major difference between the theaters was the command relationship that those opening airbases had to deal with.

In the European command, the USAAF commanded those units charged with airfield operations. In the southwest Pacific, the resources required to open airbases were split between three commands at one time. Gen MacArthur centralized aviation engineers under Brigadier General Casey, the Chief Engineer for the general headquarters, with Army engineers and Navy Seebies.¹⁷ General Casey felt strongly that the limited resources in the Pacific and the terrible logistical conditions that US forces were facing at every location required the consolidation of the engineers to enable the best use of critical manpower and resources. In addition to engineers, both aviation maintenance and supply in the area of operations were also separate commands until Gen LeMay centralized them in 1944 within the 20th Air Force.¹⁸ This consolidation made an immediate impact and was key to the unparalleled accomplishments of the 20th Air Force. One example of the scope of airbase opening operations is the China “Hump” operations. Over 300 thousand Chinese laborers were used to hand build four 8500 foot bomber runways.¹⁹ In the

European theater, the Allies reutilized numerous airbases captured from the enemy throughout the war. This was the initial plan for the Pacific theater as well.

Unfortunately, the Japanese airbases were found to be so inadequate that it amazed many that Japanese could even use them. The total number of airfields opened between the initial operations in Australia to the final airbase opening operations of World War II in Okinawa was over 200.²⁰ That is quite an amazing feat considering the oppressive environment that the troops faced day after day, year after year. There is a thoroughly recorded history of Army Air Force Operations in World War II. However, the detailed accounts of airbase opening operations are limited primarily to the construction side of airfields. There is little on the other aspects of airfield operations and base operating support identified for airbase opening operations.

Korea and Vietnam saw the newly formed US Air Force stand on its own continuing to be employed in an expeditionary manner during both of these wars. However, the airpower of the day was dominated by the long range bombers and “fighting” the cold war. There were a number of challenges in both wars providing expeditionary combat support to tactical aviation. They ranged from newly designed aircraft requiring longer and wider runways and larger fuel storage requirements in Korea, to constrained parking areas and airbase ground defense at airfields in Vietnam. These challenges refocused the US Air Force on the expeditionary nature of airpower for a fleeting time after each conflict. Each time, the ongoing cold war and established airpower doctrine moved expeditionary airpower employment back to a secondary priority while keeping forward-based permanently stationed airpower as the first priority. The exception to this focus was the utilization of airlift worldwide.

In Korea, airbase opening operations were again key to the overall success of United Nations forces supporting South Korea. At the outbreak of the war, there were only two useable airfields and the runways were relatively short. Additionally, the newly formed US Air Force had no Aviation Engineering support organic to the Air Force. They relied on Army units that the military placed under Air Force control.²¹ This was an improvement to the situation experienced in the southwest pacific during World War II. The downfall was that the engineering brigades did not keep up with the changing nature of airpower. Their equipment was old and their procedures were not ready for the introduction of jet aircraft. Jet aircraft complicated airbase opening operations from the airfield constructive perspective and the maintenance side due to engine maintenance requirements. The steel planking used initially caused landing gear failures and even accidents. These issues were exacerbated on jet aircraft due to smaller wheels and faster landing speeds.²² This demonstrates the importance of having those involved with airbase opening operations also involved with planning to include fielding of new aircraft. It was noted during the initial stages of the war that “no single factor so seriously handicapped the Fifth Air Forces operational capabilities as the lack of adequate air facilities.”²³ This was due to a combination of the preparation of airbase opening forces prior to the war, status of their equipment, the remote location of the war, and the changing face of airpower. Coalition units eventually handled these challenges resulting in over 700,000 sorties flown from 55 airfields that were opened by coalition units.²⁴

By the time that Vietnam started, the issue with the Air Force not owning all the forces required to open airbases, namely aviation engineers, had been solved. The establishment of Air Force Civil Engineering in 1959 cemented that change.²⁵ There

were two types of civil engineering teams utilized by the Air Force in Vietnam: Base Engineer Emergency Force known as “Prime BEEF” and Rapid Engineer Deployable Heavy Operational Repair Squadron still known today as “RED HORSE.” The two teams, combined with Navy Seabees and Army Engineers, formed the US construction capabilities available in Vietnam. The opening of airbases in Vietnam started slowly. Initially, there were just three Main Operating Bases (MOBs) with Forward Operating Bases (FOBs) dispersed throughout South Vietnam.²⁶ The establishment of new airbases was a focus of senior leadership including the Secretary of Defense. The preponderance of the documentation regarding airbase opening operations are limited to airfield construction, airbase ground defense, maintenance support, and supply support in Vietnam.

Throughout the 1980s, there were a number of expeditionary uses of US Air Force airlift forces to include noncombatant evacuation operations and support of Operation Urgent Fury, as examples. The fall of the Berlin wall signaled the end of the Cold War which the United States had been “fighting” since the end of World War II. With the end of the Cold War, events in the world caused the US Air Force to execute a number of expeditionary operations. The first was Operation Just Cause in Panama. This was followed by the watershed event that showed that the US Air Force could execute a large scale expeditionary operation. At 1725 on 7 August 1990, 24 F-15Cs from Langley Air Force Base, VA launched and headed to Saudi Arabia to kick off Operation Desert Shield and eventually Operation Desert Storm.²⁷ Operation Desert Shield and Operation Desert Storm resulted in 1540 Air Force aircraft being deployed to the area of operation in support of combat operations.²⁸ There is no better example of the expeditionary nature

of US airpower than this. Operations Northern and Southern Watch, which followed Operation Desert Storm, caused the United States forces to maintain a deployed and ready state in the Middle East region. As AFDD 1-1 describes, the Air Force was the smallest it had been since forming in 1947, yet a number of small scale contingencies and the ongoing Operations Northern and Southern Watch stressed the Air Force and forced it to refocus on expeditionary operations.²⁹ Operation Desert Storm proved that the Air Force could still be expeditionary. The Expeditionary Aerospace Force initiative that followed provided the foundation to make institutional changes to the Air Force which were vital to sustaining this highly expeditionary force.

Airbase Opening in Operation Desert Storm relied on the host nation like never before. Aircraft were based at a number of locations in the Middle East. There were at least 25 airbases in operation within the theater to support Desert Storm operations.³⁰ The immediate concern of all involved was to ensure forces were in place to defend Saudi Arabia from an attack by Iraq. The operational plan for this region was still under review when the deployment started which meant that the deployment timeline was incomplete. This resulted in a number of “teeth before the tail” decisions that created difficulty for troops upon arrival. The airbase opening operations (engineers, fuels, munitions, security police, services, and others) spread across the range of experiences from arriving at a Saudi Arabian base that was ready for aircraft to arriving at a base with no facilities. For example, F-16s from Shaw Air Force Base, SC arrived and until base opening operations were complete they had to sleep under the wings of their aircraft.³¹ The 1 FW arrived 3 days before their combat communications support arrived. They received the Air Tasking Order via C-21 courier nightly.³² Air Force engineers completed more than 25 projects

and a Saudi-US contractor team south of Riyadh completed the largest base in Saudi Arabia.³³ Airbase ground defense was a key concern and Desert Shield operations showed that joint rear area security operations needed some attention. There was a lack of thorough knowledge, by both Air Force Security and Army Military Police, about their roles in rear area security operations.³⁴ The questions centered on where the Army fit into overall base defense operations. It boiled down to the priority of airbase security in the overall joint rear area defense operations. The *Gulf War Air Power Survey*, Volume III, part II, provides an in-depth review of air base ground defense with respect to the overall joint rear area security plan. The *Gulf War Air Power Survey* is an excellent and very detailed source of Desert Storm operations (see figure 1) and shows how well the Air Force can conduct single service airbase opening operations. It provides a glimpse of potential issues facing each base in an increasing joint environment with a thorough discussion on airbase ground defense.

The Expeditionary Aerospace Force initiative and the resulting changes were key to the successful employment of airpower in Operation Allied Force (OAF), Operation Enduring Freedom, and Operation Iraqi Freedom. While the changes were AF-wide, there was a focus on the combat air forces, since airlift forces had continued its expeditionary operations throughout. Airbase opening operations in OAF centered on using existing NATO bases with few exceptions, one of which will be discussed in the next section. The nature of airlift operations continued to mature and led to the creation of the Contingency Response Group.

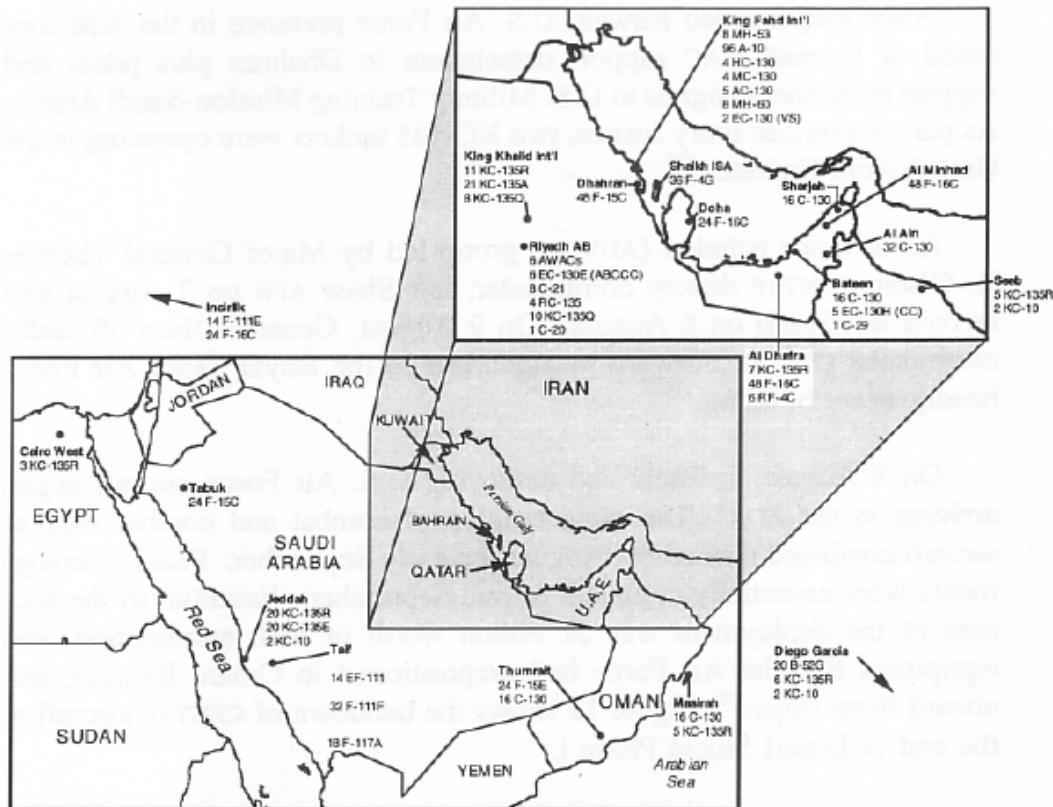


Figure 1. CENTAF Aircraft Beddown at End of Phase 1

Source: Richard L. Olson et al., *Gulf War Air Power Survey*, vol. 3 (Washington, DC: Government Printing Office, 1993), Part II, 36.

Air Force Contingency Response Group

With the expeditionary nature of airpower throughout its history established, this section explores the genesis and development of the Air Force Contingency Response Group. The article that first brought the topic of airbase opening to the forefront was written by General John Jumper, former United States Air Force Chief of Staff, while he was the Commander of United States Air Forces in Europe. He wrote a detailed article about the newly formed 86th Contingency Response Group based at Ramstein Air Base. In the article, he highlights the number of contingencies that the Air Force has responded to and points out that most of them were without deliberate plans. This drove the need for

aerospace power to adapt and try something new. The Contingency Response Group (CRG) was approved by General Michael Ryan, the Air Force Chief of Staff and USAFE was chosen as the test bed. The genesis of the new organization was the need to reduce the amount of personnel required to survey and set up operations, in addition to improve the Air Force's capability to respond quickly. Gen Jumper describes the CRG as a "multidisciplinary, cross-functional team whose mission is to provide the first on-scene Air Force forces trained to command, assess, and prepare a base for expeditionary forces."³⁵ This concept was utilized less than four weeks after the first CRG was established. It provided support to US European Command in Tirana, Albania for Joint Task Force (JTF) Shining Hope in April 1999. The CRG successfully established a secure environment with the required communications only hours after landing.³⁶ Gen Jumper points out that CRGs must be able to operate across the spectrum of conflict from permissive to hostile environments. The US Air Force recognized the powerful impact that the 86th CRG had in the European Command area of responsibility.

The US Air Force began the process to establish CRGs in each combatant command and even established multiple Contingency Response Wings in the continental United States. The overarching document governing the establishment, training, and employment of these CRGs is the US Air Force Concept of Operations (CONOPS) developed by headquarters Air Force in 2004. The purpose of the document was to establish consistency across the US Air Force.³⁷ The CONOPS details the rapid nature of the capability of CRG and the wide range of environments that the CRG must be able to operate in. For example, it dictates that the CRG must be able to operate in austere locations, in permissive or uncertain environments, and respond within 12 hours of

notification.³⁸ The CONOPS describes in detail the multifunctional capabilities and requirements that the CRGs have or need. For example, these capabilities range from intelligence to security to air traffic to aircraft maintenance. The CONOPS describes airbase opening as having three phases: runway open, airfield open, and airbase open. In addition to the three phases it describes five stages “associated” with airbase operations. These stages are: airbase survey, transition from seizure to follow-on forces, airfield assessment, airfield established, and airfield operational. The description of these stages is key to understanding the differences between them. However, for this thesis, it is only important to note that airfield established includes the establishment of command and control, fuels, base operating support, aircraft maintenance, air traffic control, and operational support. All of these functions during this stage are focused on the ability to accept the arrival of the first mission aircraft.³⁹ The CONOPS also discusses the command and control relationship of the CRG. However, it is limited in the standard tactical or operational control relationship with the Unified Combatant Commands. It does not explain expected command relationships with other forces at an airfield nor does it expound on the role of the senior CRG member (typically an O-6) in the overall command structure of a joint airbase.

While the CRG is a great example of Air Base Opening Operations, it is an AF organization primarily setup to initiate and conduct airlift operations at an airfield. It was not created to solve the airbase opening operations for tactical airpower employment. It does provide the foundation that can be built upon, since the majority of tactical airpower employment from an airfield begins with airlift operations at the airfield to bring in equipment and personnel required to conduct tactical airpower employment. Also,

missing from the review of the CRG and arguably more important is a thorough discussion of joint operations at the airbase. The CRG CONOPS mentions working sister services and states the need for a multiservice TTPs for airfield seizure handoff to CRG.⁴⁰ However, this handoff is only one aspect of joint airfield operations. The overarching guidance for joint airbase operations must be in joint doctrine so a review of that doctrine is in order.

Look at Overarching Doctrine

Joint operations are covered at the 50,000 foot level by JP 3-0, *Doctrine for Joint Operations*, the foundational document upon which all doctrine on joint operations is based. It is the linchpin for all other joint operations publications in use by the United States. The document covers the fundamental principles of joint operations, planning guidance for war and discusses multinational operations considerations. In addition to JP 3-0, JP 4-0 serves as the key joint doctrine for logistics support to the joint forces and JP 3-10 is the joint doctrine document governing joint rear area operations.

JP 3-0 describes how joint integration is required to generate decisive combat power. It further describes how Joint Forces Commanders must synchronize and integrate the joint and multinational forces to ensure successful operations. These planning considerations include mission, commander's intent, concept of operations, and support relationships. One key responsibility that the joint forces commander has is the directive authority for logistics. This authority enables the joint forces commander to ensure economy of operations and prevent the duplication of facilities and functionality among the services. This is especially important at bases that are joint use locations. This authority allows the commander to designate a particular service to provide a particular

type of support to all units at a base regardless of service affiliation. The ability to designate joint rear areas ensures that specific land within an area of operations is designated as a joint rear area to facilitate protection and operations of installations and forces supporting the joint forces. While there is no specific mention of airbases within the joint rear area paragraph, it is the best fit for joint use airbases in JP 3-0.

General basing is given some specific attention in the publication. It describes how basing is the foundation of joint operational art by affecting critical factors such as sortie generation and resupply operations. Basing decisions are often influenced by political and diplomatic considerations and cover the spectrum from permanent bases with well developed infrastructures to temporary bases in austere locations. The JP also describes how the Joint Forces Commander must coordinate the use of airfields.⁴¹ The publication establishes the combatant commander as the responsible party for ensuring effectiveness and economy of forces in operations and preventing the duplication of facilities and overlap of functions between the services.

There are two other overarching JPs that shed some light on the issues relating to airbase opening operations. These two publications are JP 4-0, *Doctrine for Logistics Support of Joint Operations*, and JP 3-10, *Joint Doctrine for Rear Area Operations*. JP 4-0 is the capstone document for joint logistics just as JP 3-0 is for joint operations. It covers logistics at the strategic and operational levels. The publication specifically mentions base operations support, the first to do so. It describes that during contingency operations one service is normally assigned base operations support for all services to include facility acquisition.⁴² However, that is the extent of the description or discussion specific to base operations support. Civil engineering planning described in JP 4-0,

details that the Civil Engineering Support Plan contains requirements for base development, essential facilities, and force beddown. Overall, the geographic combatant commander is responsible to identify any requirements for base development. The JP dictates that the use of host nation facilities should be maximized especially in occupied areas and the geographic combatant commander can direct the transfer of facilities between services. However, other support services to include food service, exchange, billeting, laundry, shower, postal, and finance are to be provided by the service component. This is not always the most efficient use of joint resources and the geographic combatant commander must consider the elimination of duplication and increased efficiency when evaluating the responsibilities at joint bases. The publication also describes the key elements of the logistics system in which under units are specified as being responsible for operating bases and airports. Also, in logistics system considerations, the publication says that the assignment of responsibility of bases and airport operations should be done by the geographic combatant commander in coordination with Transportation Command. The inclusion of this coordination comment shows that joint doctrine regarding base and airports operations are primarily focused on airlift operations.⁴³ Lastly, JP 4-0 describes the Joint Facilities Utilization Board (JFUB) which evaluates and reconciles component requests for real estate, use of existing facilities, and interservice support requirements. This board is activated by the geographic combatant commander or subordinate JFC and chaired by J-4 or engineer from that level of command. This describes the board in generalities but does not go into specifics on how items from a joint base get elevated from a commander on the ground to the joint facilities utilization board.

The other joint doctrine to evaluate as overarching guidance is JP 3-10, *Joint Doctrine for Rear Area Operations*. This document primarily focuses on the joint doctrine regarding security operations in rear areas both single service and joint. The publication describes how normally the Joint Forces Commander (JFC) designates a Joint Rear Area Coordinator (JRAC) and the Joint Rear Area (JRA) which is an area to facilitate protection and operations of installations and forces supporting the joint force. The JRAC is responsible for coordinating security of JRAs.⁴⁴ The publication does a detailed job explaining base level defense responsibility the commander has overall responsibility, and base cluster commander responsibilities, coordination of the defense of bases within the clusters. The publication points out that the size of a JRA can vary considerably and the airspace above the JRA is not included in the JRA. The JFC must classify bases into one of two categories either a single service base or a joint base. If it is classified as a joint base it is further classified whether a single service has the prime interest or two services have a coequal interest. The JFC may segment the JRA with component commands with area responsibilities. An example of this is a Marine Expeditionary Unit may be given area responsibilities and within that area they may collocate their combat service support with elements of its combat aviation.⁴⁵ Component commanders given area responsibilities have the ability to designate base commanders or base cluster commanders with the concurrence of the JFC for bases within their area. The publication mentions base commanders and base cluster commanders a number of times. However, their mention is restricted to the security realm. It points out that base cluster commanders are responsible for coordinating and integrating base defense plans and that base commanders are responsible for base defense. The publication also describes

infrastructure development as being generally applicable to all permanent installations and facilities.⁴⁶ While JP 3-10 does talk about a lot of issues germane to the airbase opening operations topic, it is not comprehensive with respect to airbases. There is no mention of airbases or airfields and their operations in a joint environment. It does provide some overarching guidance on base responsibilities that can be applied to airbases and airfields operations.

In the US Army's two capstone doctrine documents relating to operations and logistics there is little mention of bases and none of airfield operations. In FM 3-0, *Operations*, the only mention of bases or rear areas is in the sustaining operations section of the field manual. It describes five types of sustaining operations: combat service support, rear area and base security, movement control, terrain management, and infrastructure development. Rear area and base defense information is limited to just base defense while infrastructure development is bounded by the limitation that the installations and facilities be fixed and permanent.⁴⁷ The only other mention of airfields is relating to forcible entry operations and securing a lodgment at the airfield. It describes the airfield solely as a means to rapid reinforcement. FM 3-0 also introduces the concept of intermediate staging bases as a point outside the area of operations where equipment, personnel, and supplies can be brought together in a limited reception, staging, and onward integration prior to moving into the area of operations. FM 4-0, *Combat Service Support*, also discusses intermediate staging bases. The discussion in FM 4-0 again is focused on providing a location to stage combat service support for entry into the area of operations. The only relation of intermediate staging bases with airfield operations is the

mention that these bases can be used with airlift and that the bases provide the same type of base operations support expected at an airbase.⁴⁸

In Air Force Doctrine there are three primary documents that best compare to the doctrine at the joint level reviewed above. They are Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*; AFDD 2, *Organization and Employment of Aerospace Power*; and AFDD 2-4, *Combat Support*. AFDD 1, “the Air Force’s premier statement of our beliefs,” briefly describes under Expeditionary Combat Support that the capabilities of the Air Force includes the ability to beddown and employ in support of Air Force and joint operations.⁴⁹ This statement in Air Force doctrine acknowledges the importance of the joint community in establishing an airbase. In AFDD 2, there is limited mention of base operations. There are two mentions of base development and timing beddown availability within the Joint Air Operations Plan section. There is one mention within the Joint Air Operations Center section of reducing the mobility footprint of deploying units and optimizing resources. There is some discussion within the Commander Air Forces section about the responsibilities of the different members on the A staff. The description for the A-4 position includes a laundry list of support activities to include coordinate and supervise: force beddown, transportation, civil engineering, lodging, fire fighting, food, supply explosive ordnance disposal, and mortuary affairs to name a few. The A-4 is expected to maintain a relationship with the JTF J-4.⁵⁰ However, in the sections that cover Air Expeditionary Wings, Groups, and Squadrons, there is no discussion of their support responsibilities, just of the command relationships. There is one exception in the command relationship of the Air Expeditionary Squadron, the publication states that a squadron can not go alone; it must have support from other

organizations (groups or wings). The third overarching US Air Force doctrine document is AFDD 2-4, *Combat Support*. As one might expect, there is significant discussion about airpower support operations. The publication describes the concept of agile combat support and expeditionary combat support. It defines agile combat support as, “actions taken to create, effectively deploy, and sustain US military power anywhere.”⁵¹ It goes on to say it is the foundation for air and space power. It describes expeditionary combat support as “the deployed ACS capability to provide persistent and effective support for the applications of Air and Space power on a global basis.”⁵² Agile combat support capabilities include three related topics relevant to this thesis: establish operating locations, posture responsive forces, and support the mission, forces, and infrastructure. A key concept that the publication introduces is the use of “force modules.” These force modules are described as a “packaged capability of combat and combat support forces to a combatant commander.”⁵³ It uses as an example that the Air Force recommends the use of five force modules for base establishment (open the airbase, command and control, establish airbase, generate the mission, and operate the airbase). However, the publication does not explore any further how these force modules would operate. There is one key element included in the publication that is germane to this thesis. In the section on joint operating bases, AFDD 2-4 calls for the senior airman at a joint base to have “some” level of authority over airfield operations even if there is another service with a more senior officer.⁵⁴ This is the first publication of any of the overarching doctrine documents reviewed that addresses the operations of an airfield specifically. Unfortunately, the wording of the statement is fairly weak with words like need versus must and some versus delineating the level of authority required to run the airfield. Also missing from

this publication is any mention as to how operations would change at the joint operating base which is consistent across each of the service specific doctrine documents.

The topic of airbase opening was raised in 2005 within the joint doctrine community by Maj Mark Brown, Air Force Doctrine Center, in the joint doctrine's monthly newsletter. In it, he describes that due to the experiences of OEF and OIF the US military must look at airbase opening from a joint perspective and identify and resolve any seams found.⁵⁵

Other Relevant Documents

The Air Force is not alone in dealing with airbase opening operations. The Marine's established an expeditionary airfield at Camp Rhino during OEF in Afghanistan. The operation was detailed in the *Marine Corps Gazette* in June 2002 identifying what went well and some of the issues they had as well. It is an example of how well a single service following its established doctrine can execute airbase opening. Colonel John Robbins explains in an *Air and Space Power Journal* article about the initiation of A-10 operations at Tallil Air Base, Iraq during OIF. He describes the fact that the base required detailed coordination with the Army to set up operations. Additionally, he noted that they went around the Army processes utilizing HC-130s supporting the Combat Search and Rescue Helicopters, the first AF assets on the ground, at Tallil Air Base as an alternate source of supply for the Air Force personnel. While operations were initiated almost immediately, Col Robbins identified that base operating support was key to producing Airpower.⁵⁶ These examples detail the importance of exploring in detail airbase opening for the joint community.

Due to the majority of major combat operations occurring with US Central Command's (CENTCOM) Area of Responsibility (AOR), they have developed the most detailed procedures for handling base operations. Their overarching guidance is CENTCOM Regulation 415-1, dated 1 December 2004. The short name for this document is "The Sand Book." This guidance is detailed and includes the designation of a Base Operating Support-Integrator (BOS-I) and a Senior Airfield Authority (SAA).⁵⁷ This guidance is the first step in clearly delineating who has the responsibility for airfield operations and base operating support which is key to the planning of airbase opening operations in both permissive and nonpermissive environments. The regulation describes the BOS-I as the component, or Joint Task Force (JTF), that "acts on behalf of all forces and services on the camp."⁵⁸ The SAA is described as "the component responsible for the control, operation, and maintenance of the airfield to include the runways, associated taxiways, and parking ramps as well as land and facilities whose proximity affects airfield operations."⁵⁹ The responsibility of the SAA is broad which at a joint base impacts the operations of other base users. However, this regulation's focus is on construction and base camp development. The BOS-I and SAA information is just one of many items of this regulation which is likely not of interest to those not engineers. There is no airfield or joint base operations regulation that includes either BOS-I and SAA responsibilities. While this regulation does not address specifically airbase opening operations, it is the sole authoritative publication that provides guidance relating base support and airfield authority with detailed responsibilities for each position. Figure 2 is an example chart with the elements of BOS-I and SAA as US CENTCOM defines it for

bases in its area of responsibility. The effect of the guidance in the regulation began to show in a recently conducted Center for Army Lessons Learned study.

The Center for Army Lessons Learned teamed with the Office of Air Force Lessons Learned to conduct a Joint Airfield and Airbase study in March of 2005. The purpose of the study was to collect and analyze OEF and OIF joint airfield operations with specific attention to airfield support operations, airfield safety, airfield defense, and SAA. The team visited multiple locations in both OEF and OIF Areas of Operation. It was detailed in the report that BOS-I includes: contracting, messing, water, sanitation, laundry, bath, environmental, field engineering , material handling equipment, explosive ordinance disposal, medical, nuclear-biological-chemical readiness, industrial, road and rail, storage, utilities, training lodging, gate security, perimeter security, and internal security. The SAA includes: refueling, crash fire rescue, air traffic control services, weather, airfield lighting, fleet service, and material handling equipment.⁶⁰ In addition to detailing the responsibilities of the BOS-I and SAA very well, the study identifies that while The Sand Book delineates the SAA's responsibilities the BOS-I for the base may not acknowledge these responsibilities as authority on those matters.

UNCLASSIFIED

This field classified **SECRET/NOFORN**. Information is available on the SIPRNET web site

Source: Colonel David Neuenswander team chief for the 2005 Center for Army Lessons Learned, Joint Airfield and Airbase Operations Study, Ft. Leavenworth, KS.

35

some joint bases. This study also points out that the priorities of the SAA and BOS-I for the airfield or the area affected by the airfields do not always match up and once funding is acquired by one service or the other additional problems may arise.⁶² Additionally, the report details the joint interaction in the areas of air traffic control and base defense. Overall, this document is the most comprehensive document to date regarding joint airbase operations. It provides a great snapshot in time look at joint airbase operations in OIF and OEF as of March 2005. The airfields visited were in operation for over a year minimum (OIF) and as long as three years (OEF) which would qualify them to be established airbases.

There are two other research works that start to tackle the issue of base operating support when related to the Air Force or airfield operations and the command and control of joint use airfields. The first was a thesis written by Maj William Summers while a student at Command and General Staff College. In the thesis, he thoroughly discusses the issues of command and control from the air traffic control aspect of joint airfield use. He addresses equipment, procedures and command issues as they relate to safe and secure air traffic control. He recommends that joint teams be established to open and operate airbases similar to the joint communications support element that CENTCOM established at MacDill Air Force Base, Florida, to support their area of responsibility. These teams would use the Air Force CRGs as their core and supplement them with appropriate Army and Navy personnel to allow the team to effectively work with all services.⁶³ While his research focused on air traffic control aspects, he identified other areas that required further study to include logistical support and airbase defense.

In 2003, Major David Vaughn, Air Force Institute of Technology student, attempted to define base operating support and a new concept he deemed airfield operating support. The thesis explained base operating support as the Army utilizes the term and how the Air Force defines the term. In addition, he identified those elements that aviation requires to conduct operations which he called airfield support. The impetus for his research was the establishment of bases during OEF where base operating support of each base was given to a separate service and the problems created based on the fact that each service had a different concept of what base operating support was.⁶⁴ His description of airfield operating support is very useful in this thesis as it is one model that describes the different elements that must be addressed in airbase opening. He detailed the differences between the Army and the Air Force with respect to base operating support and provided a good foundation for the idea of airfield operating support and differences between the two. He stopped at the point of definition but realized that there was more work to do in future research endeavors.

Most of the other works relating to expeditionary airfields do not address airbase opening or airfield operating support. They focus either on the equipment needed to set up a bare base or the runway. For instance, Lt Col Wager explored the current status of bare base equipment and the needs but does not explore the interaction of Air Force equipment with other service's equipment that would be found in the joint environment.⁶⁵ This is appropriate since the focus of his paper was Air Force equipment but equipment compatibility can cause problems at joint airbases. During JTF Shining Hope, when the Army arrived at the airfield with all their communications equipment there became an immediate problem with respect to frequency management because joint

operations at an airbase had not been planned, exercised or deconflicted. They worked through it, but it took effort away from the mission they were accomplishing.⁶⁶ This example demonstrates the crucial nature of integration between the services at joint airbases on even things like communications and base operating support equipment. It is the key to safe and successful mission accomplishment.

Conclusion

Together, this look at the pertinent literature relating to airbase opening operations provides a thorough review of the history of airpower with respect to its expeditionary nature, documented history of airbase opening operations, current Air Force initiatives, joint and service doctrine, and other relevant key documents. While this literature review depicts the background relating to airbase operations, it also identifies some of the gaps in the existing literature. The lack of definitive research on this topic is a strong reason why this is a priority one topic at the AF Institute of National Security Studies.

¹War Department, FM 100-20, *Command and Employment of Air Power* (Washington, DC: Government Printing Office, July 1943), 4.

²*Merriam-Webster Online Dictionary*, s.v. “expeditionary”.

³Headquarters, Department of the Air Force, AFDD 1-1, *Leadership and Force Development* (Washington, DC: Government Printing Office, February 2006), 20.

⁴Lieutenant Colonel David C. Rutenberg and Jane S. Allen, eds., “American Logistics, 1774-1985-Emphasizing the Development of Air Power,” in *The Logistics of War: A Historical Perspective, The Logistics of Waging War*, eds. Beth F. Scott, Lieutenant Colonel James C. Rainey, and Captain Andrew W. Hunt (Maxwell Air Force Base: Air Force Logistics Management Agency, 2000), 50-53.

⁵*Ibid.*, 57-60.

⁶*Ibid.*

⁷Jerome G. Peppers, Jr., “The History of US Military Logistics: 1935-1985,” in *The Logistics of War: A Historical Perspective, The Logistics of Waging War*, eds. Beth F. Scott, Lieutenant Colonel James C. Rainey, and Captain Andrew W. Hunt (Maxwell Air Force Base: Air Force Logistics Management Agency, 2000), 286.

⁸W. F. Craven and J. L. Cate, eds., *The Army Air Forces in World War II*, Vol 7 (Manchester, NH: Ayer Company Publishers, December 1979), 239.

⁹Barry Anderson, *Army Air Forces Stations* (USAF Historical Research Center, 1985), 5.

¹⁰*Ibid.*, 6.

¹¹*Ibid.*, 8

¹²Craven and Cate, 252.

¹³*Ibid.*, 253.

¹⁴*Ibid.*, 267.

¹⁵*Ibid.*, 274.

¹⁶Rutenberg and Allen, 91.

¹⁷Craven and Cate, 277.

¹⁸Rutenberg and Allen, 88.

¹⁹*Ibid.*, 87.

²⁰Craven and Cate, 276.

²¹Don K. Temajan III. “Aviation Engineer contributions to the Air War in Korea,” *Civil Engineering* (Winter 2001-2002): 14.

²²Peppers, 316.

²³Temajan, 20.

²⁴*Ibid.*, 21.

²⁵Air Force Civil Engineering Support Agency, *Foundations for the Future: A History of Air Force Civil Engineers* [document on-line]; available from http://www.afcesa.af.mil/ceb/history/ce_history.asp; Internet; accessed 20 December 2005.

²⁶Rutenberg and Allen, 133.

²⁷Richard P. Hallion, *Storm Over Iraq* (Washington, DC: Smithsonian Books March 1997) 136.

²⁸*Ibid.*, 157.

²⁹Headquarters, Department of the Air Force, AFDD 1-1, *Leadership and Force Development* (Washington, DC: Government Printing Office, February 2006) 62-63.

³⁰Daniel L. Haulman, "Footholds for the Fighting Force," *Air Force Magazine* 89, no. 2 (February 2006): 77.

³¹Richard L. Olson et al., *Gulf War Air Power Survey* (Washington, DC: Government Printing Office, 1993) Vol 3, Part II, 18.

³²Alexander S. Cochran et al., *Gulf War Air Power Survey* (Washington, DC: Government Printing Office, 1993) Vol 1, Part II, 108.

³³Daniel L. Haulman, "Footholds for the Fighting Force," *Air Force Magazine* 89, no. 2 (February 2006): 77.

³⁴Olson, et al., 36.

³⁵Gen John P. Jumper, "Rapidly Deploying Aerospace Power: Lessons from Allied Force," *Aerospace Power Journal* 13, no. 4 (1999): 4-7.

³⁶*Ibid.*

³⁷Headquarters, Department of the Air Force, *Contingency Response Group Operational Concept* (Washington, DC: Government Printing Office, April 2004) 1.

³⁸*Ibid.*, 3.

³⁹*Ibid.*, 6.

⁴⁰*Ibid.*

⁴¹Chairman of the Joint Chiefs of Staff, JP 3-0, *Doctrine for Joint Operations* (Washington, DC: Government Printing Office, September 2001), V.

⁴²Chairman of the Joint Chiefs of Staff, JP 4-0, *Doctrine for Logistics Support of Joint Operations* (Washington, DC: Government Printing Office, April 2000), VII.

⁴³*Ibid.*, IV-3.

⁴⁴Chairman of the Joint Chiefs of Staff, JP 3-10, *Joint Doctrine for Rear Area Operations* (Washington, DC: Government Printing Office, May 1996), VII-VIII.

⁴⁵*Ibid.*, II-8.

- ⁴⁶*Ibid.*, VI-1.
- ⁴⁷Headquarters, Department of the Army, FM 3-0, *Operations* (Washington, DC: Government Printing Office, August 2003), 96.
- ⁴⁸Headquarters, Department of the Army, FM 4-0, *Combat Service Support* (Washington, DC: Government Printing Office, August 2003), 3-20 - 3-22.
- ⁴⁹Headquarters, Department of the Air Force, AFDD 1, *Air Force Basic Doctrine* (Washington, DC: Government Printing Office, November 2003) 48.
- ⁵⁰Headquarters, Department of the Air Force, AFDD 2, *Organization and Employment of Aerospace Power* (Washington, DC: Government Printing Office, February 2000) 63.
- ⁵¹Headquarters, Department of the Air Force, AFDD 2-4, *Combat Support* (Washington, DC: Government Printing Office, November 2003) 1.
- ⁵²*Ibid.*
- ⁵³*Ibid.*, 12.
- ⁵⁴*Ibid.*, 25.
- ⁵⁵Mark Brown, “Airbase Opening Concept,” *A Common Perspective*, 13, no. 1 (2005): 23.
- ⁵⁶Col John Dobbins, “Airpower 101: An Expeditionary Air Base Model,” *Aerospace Power Journal*, 18, no. 3 (2004): 54-65.
- ⁵⁷United States Central Command, R415-1, *Construction and Base Camp Development in the USCENTCOM Area of Responsibility (AOR)*, “*The Sand Book*” (Washington, DC: Government Printing Office, 20 March 2006), 13.
- ⁵⁸*Ibid.*
- ⁵⁹*Ibid.*, 15.
- ⁶⁰Center for Army Lessons Learned, *Joint Airfield/Airbase*, No. 05-01 (Ft. Leavenworth, KS: CALL, July 2005), v.
- ⁶¹*Ibid.*, vi.
- ⁶²*Ibid.*, vii.
- ⁶³William C. Summers, “Joint Forward Operating Base Elements of Command and Control” (Thesis, US Army Command and General Staff College, 2002), 76.

⁶⁴David S. Vaughn, “Defining Base Operating Support and Airfield Operating Support” (Thesis, US Army Command and General Staff College, 2002), 76.

⁶⁵Vic Wager III, “Bare Base Equipment and Support of the Expeditionary Air Force” (Thesis, Air War College, 2002), 42.

⁶⁶Summers, 42.

CHAPTER 3

THE RESEARCH METHOD

The best insurance policy for the future of an industry is research, which will help it to foresee future lines of development, to solve its immediate problems, and to improve and cheapen its products.¹

Sir Harold Hartley

The above quotation describes the primary challenges of the United States Armed Forces as the military strives to learn from the past and become better able in the future. As the quote indicates, this thesis researches current problems and works to recommend changes that will improve the “product” of airbase opening operations. The need to effectively seize, open, and operate airbases is key to providing superior close air support and airlift support in today’s contemporary operating environment. To determine the sufficiency of current doctrine a number of secondary issues must be addressed as well. This thesis examines the doctrine relating to the seams between airbase seizure and initial airbase opening and the seams (where one operation stops and next operation begins) between initial airbase opening and long-term operating locations. The research does not focus on the initial seizing of the airfield or permanent operating bases but addresses events that take place during the planning process. The thesis topic is timely during the Global War on Terrorism as the military has operations across the world on airfields in operational environments that range from permissive to unknown to hostile.

This thesis is to improve airbase opening operations which in turn will improve the ability of the US Air Force to rapidly and efficiently provide airpower to the Joint Forces Commander in Area of Operations worldwide.

This chapter, Research Methodology, describes the criteria that was used in this thesis and provides the two categories the research focused on. The criteria was developed based on a review of current doctrine and current guidance. The two categories that the researched focused on are doctrine and case studies. The doctrine section will include other specific guidance about airbase opening operations that may not be in doctrine yet but is needed to answer the research questions. The case studies will focus on events in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). The methodology described below provided sufficient data to evaluate the research questions and draw conclusions and make recommendations.

The criterion utilized by the author to evaluate the data collected is twofold. The foundation of the criteria for the analysis of doctrine was based on the Base Operating Support-Integrator (BOS-I) and Senior Airfield Authority (SAA) matrix utilized by United States Central Command in its area of responsibility. This matrix was selected due to its widespread use across the number of joint airbases currently in operations and is the only matrix that comprehensively looks at all the functions required to run an airbase both airfield-related and general support of the airbase. The original matrix can be found in chapter 2. The areas evaluated are: contracting, messing, water, sanitation, laundry, bath, environmental, field engineering, materials handling equipment, explosive ordnance disposal, medical, nuclear biological and chemical services, industrial, road, rail, storage, utilities, training, lodging, gate security, internal security, perimeter security, refueling, crash, fire, rescue, air traffic control, weather, lighting, fleet service, materials handling equipment, and communications integrator. See appendix A for the doctrine evaluation worksheet utilized for each publication reviewed and Table 1 for the matrix

used to summarize the information gathered on airbase opening operations doctrine. Each area based on the BOS-I and SAA matrix was evaluated against the joint and relevant service doctrine with regards to the primary and secondary questions.

Table 1. Doctrines Analysis Matrix

[illegible]

The second criteria used applied to the evaluation of the case studies. This criteria included reviewing the following timeframe for each case study: planning, initial setup, interim operations, and transition to semipermanent operations. Each case study was evaluated on the basis of how airbase opening operations was addressed in each phase of the timeframe.

Overall, the method consisted of the following: literature review, doctrine review, case studies, and data analysis. The research focused on these areas: established doctrine, draft doctrine, other existing guidance, and case studies through historical documents, lessons learned, and interviews. First, the thesis researched the existing doctrine. This research included joint and individual service doctrine and included a review of any relevant foreign military doctrine. The review of doctrine built upon the overarching doctrine described in the review of literature. In the doctrine analysis, every current and draft joint doctrine publication was reviewed. The initial review included the reading of the table of contents and the publication summary. If there was anything in the summary or table of contents that hinted at a topic related to airbase opening (BOS-I or SAA), it was reviewed in depth. The in-depth review included examining the entire JP using the doctrine review worksheet and recording what was found. The joint doctrine analysis resulted in a total of 95 JPs reviewed revealing 22 JPs with references to aspects germane to airbase opening (BOS-I and SAA). At the end of each joint doctrine publication there is a list of references. These references include service doctrine and other relevant guidance. The references in the JPs with extensive applicability to airbase opening areas were used to determine which service doctrine or other guidance were reviewed. The service doctrine and other guidance were reviewed in the same manner as the JPs. Then the thesis researched other existing regulations and guidance in the services and combatant commands relating to airbase opening operations as appropriate. This research included a review of the role of the Contingency Response Group in airbase opening. The thesis explored the terms Base Operating Support Integrator and the Senior Airfield Authority and their role as found in existing doctrine. Research into the airbase defense

doctrine and guidance was also required to properly evaluate airbase opening operations. With this doctrine analysis complete, the thesis moved into the phase of case studies.

The second research area explored was case studies. The foundation of the case studies was established in the review of literature section which describes airbase operations as documented in history. The case studies focus on OEF and OIF with data from other operations as appropriate. The case studies show the success of single service operations in OEF and OIF using data from other operations as well. These major operations are supplemented with information from smaller contingencies conducted across the world to include noncombatant evacuation operations in Liberia, for example. After setting the stage with single service operations, the thesis explores joint operations in OEF. This included interviews with individuals involved with airbase opening operations. To round out the data required to properly examine OEF, documentation of lessons learned and articles or reports on base operations are reviewed by this thesis. After exploring OEF, OIF was studied. Again, the method was to conduct interviews with personnel involved with initial airbase opening operations. This was augmented with current experiences of users of the joint bases to identify long term effect of early airbase operations decisions. Documentation such as “On Point” and the Center for Army Lessons Learned publications among other reports and articles were used to complete the case study of OIF. These interviews were conducted primarily by email, but supplemented by phone and when possible in person. These interviews included questions tailored based on who the interviewee is and free flowing to encourage discovery of all pertinent information for that case study.

Once the doctrine and case study research was complete, the thesis evaluates both the doctrine and case studies against the criteria described above. Evaluating both the case study and doctrine using the established criteria provided a thorough body of data to evaluate the primary and secondary research questions noted in chapter 1. The data collected provided the basis of the conclusions and recommendations found in chapter 5.

¹Sir Harold Hartley, *RSIC Newsletter*, No. 318, May 1991, 1.

CHAPTER 4

ANALYSIS

An air base is a complex machine that has so many moving parts and interdependent elements that one can easily become overwhelmed by its complexity and mesmerized by only a portion of the operation.¹

Colonel John Dobbins

Introduction

As described in detail in the literature review, airbase operations are complex and vital to successful air campaigns as well as overall operations. With recent experience in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), it is timely to evaluate whether doctrine is sufficient to ensure successful future joint operations. This thesis examines adequacy doctrine regarding airbase opening operations. The thesis topic is key during the Global War on Terrorism (GWOT) as the military has operations across the world on airfields in operational environments that range from permissive to unknown to hostile. The purpose of this thesis is to improve airbase opening operations which, in turn, will improve the ability of the US Air Force to rapidly and efficiently provide airpower to the Joint Forces Commander in Area of Operations worldwide. Prior to this thesis, the topic of doctrine and airbase opening had not been studied in depth. The lack of research contributed to its selection as a priority one topic of the Air Force Institute of National Security Studies.

Chapter 4, “Analysis,” is organized to present the outcomes of the research first relating to doctrine and then the research on the case studies. The chapter weaves together the information gathered through the detailed evaluation of available doctrine which includes some draft doctrine information on areas relevant to the airbase

operations. The research questions first identified in chapter 1 are answered in this chapter. Within chapter 4, the secondary questions are grouped as either doctrine or case study and then answered prior to answering the primary research question.

The primary research question of this thesis is: Was the doctrine airbase opening doctrine in effect during Operation Enduring Freedom and initial Operation Iraqi Freedom operations comprehensive to ensure successful future joint operations? As described in chapter one, a number of secondary research questions must be addressed prior to the primary research question.

One secondary research question is not doctrine or case study related: what makes an airbase opening operation a success? Three secondary questions relating to doctrine include the following. First, what doctrine on airbase opening operations exists in the Department of Defense (DoD)? Second, is Base Operating Support (BOS), Senior Airfield Authority (SAA), and Airbase ground defense doctrine and guidance sufficient? Third, do any gaps exist in TTPs regarding airbase openings? The secondary research questions relating to the case studies include the following three questions. First, what airbase opening operations procedures were used during OEF and OIF? Second, did the US military deviate from existing doctrine regarding airbase opening operations during OEF and OIF? Third, do case studies of US airbase opening operations provide pertinent lessons learned?

Successful Air Base Opening Operations

The first secondary research question to address is: What makes an airbase opening operation a success? This question is rather tricky since success is most of the time in the eyes of the beholder. However, there are characteristics of successful

operations that are well accepted and provide a firm footing to evaluate airbase opening operations. The tenets of Army operations, which are initiative, agility, depth, synchronization, and versatility, provide a good foundation to use for characteristics of successful combat operations.² When evaluating airbase opening operations, each of these characteristics is key in ensuring that successful combat airbase operations are established as soon as possible. They each can be applied to airbase opening operations.

Initiative as applied to airbase opening operations is the “willingness and ability to act independently within the framework of the higher commander's intent.”³ Agility includes the ability to react quicker than the enemy. When applied to airbase opening operations, agility can be anything from rapid runway repair to air base ground defense activities. Depth is the extension of operations in time, space, resources, and purpose.⁴ In airbase opening operations, this applies to the airbase area of influence which is more than just the actual airfield and taxiways. This area of influence includes runway clear zones, and airbase ground defense zones. Synchronization in airbase opening operations is key. This includes arranging airbase opening events in the correct order to ensure that combat operations are initiated as quickly, safely, and combat effective as possible. This might reach from airfield assessment teams, to runway repair, to air traffic control just to name a few activities that must be synchronized. This is complicated further when multiple services are using the same airfield with different timelines and foci. The last tenet of Army operations as characteristics of successful operations is versatility. This characteristic is the ability to meet diverse mission requirements.⁵ Versatility is extremely important in airbase opening operations. Versatility may range from setting up airlift operations to reinforcing success on the ground or initiating combat aviation

operations to support troops in contact. By using the tenets of Army operations as criteria for successful operations, it is clear that airbase opening operations are indeed key to successful combat operations.

A second list of attributes from the AF also depicts what makes an airbase opening operation successful. This list is from the AF's Combat Support doctrine which identifies four key attributes of Agile Combat Support: agility, reliability, integration, and responsiveness. Agility includes the adaptive nature and resourcefulness of air and space power sustainment. Reliability counts on the effectiveness of the team and consistency of combat support. Integration is the combination of the diverse elements that make up combat support with a synergistic effect. Responsiveness is the ability to provide the right combat support when and where it is needed.⁶ These four attributes and the Army tenets of operations describe the characteristics of successful airbase opening operation.

With the general characteristics identified, there are several specific areas that make up a successful airbase opening operation. The primary measure of a successful operation will be the speed of transitioning from airfield seizure or host nation concurrence to initial airpower operations from the new airbase. The operations may range from conducting aerial port activities to personnel recovery missions to employing aircraft in air interdiction and close air support missions. Another area that indicates a successful airbase opening operations is long term use of the airbase. This must be addressed in airfield command and control relationships, facility utilization, and airbase layout. The operations of forces operating at a joint airbase must not inhibit other forces operating at the same base. The ability to transition from initial operations to long-term operations without waivers and new construction caused by decisions made during initial

airbase setup is an indication of a successful airbase opening operation. Ultimately, deficiencies in initial planning and airbase setup cause an increase in costs and risks to personnel and mission.

Evaluation of Doctrine

The three doctrine related secondary research questions are interrelated and are the core of the evaluation of this thesis. First, what doctrine on airbase opening operations exists in the Department of Defense (DoD)? Second, is Base Operating Support (BOS), Senior Airfield Authority (SAA), and Airbase ground defense doctrine and guidance sufficient? Third, do any gaps exist in TTPs regarding airbase openings? These questions are best addressed individually.

Existing DoD Doctrine

The research into the existing doctrine within the DoD regarding airbase opening operations proved labor intensive. There is no overarching doctrine regarding airbase operations. The ability to find doctrine related to airbase opening operations required in-depth review of individual doctrine documents. There are over 90 JPs which were either reviewed in total or scanned for applicability. After reviewing all the JPs, service and draft JPs were reviewed to find information on airbase operations. The best way to review the doctrine found is first to list a summary of all the doctrine reviewed and then look at the components of airbase opening operations separately. The components of the airbase opening operations are BOS, airfield, security, and communications as was described in chapter 3.

The review of the doctrine available within the DoD, depicted in table 2, lists the doctrine and whether any aspects of airbase opening operations were addressed. The tables recap the results of the doctrine analysis regarding elements of airbase opening operations. Each component is evaluated separately in the sections after the tables.

Table 2. Joint Publications Analysis Summary

			BOS														Security	COMM	Airfield					
Doctrine	Subject	Date of Pub	Contracting	Messing/water	Water	Laundry/Bath/ Sanitation	Environmental	Engineering	MHE	EOD	Medical	NBC	Industrial	Road/rail	Storage	Utilities	Lodging	Base Security	Communications	Refueling	Crash/Fire/ Rescue	ATC	Weather	Lighting
JP 1	JT Warfare of the US Armed	Nov 2000	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 0-2	Unified Action Armed Forces	Jul 2001	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 1-01.1	Comendium	Apr 1999	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	<u>PERSONNEL</u>																							
JP 1-0	Personnel	Nov 1998	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 1-05	Religious Support	Jun 2004	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 1-06	Financial Management	Dec 1999	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	<u>INTELLIGENCE</u>																							
JP 2-0	Jt Intelligence	Mar 2000	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 2-01	Jt Intel Supt to Ops	Oct 2004	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 2-01.1	Intel Spt to Targeting	Jan 2003	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 2-01.2	CI Support		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 2-01.3	IPB	May 2000	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 2-03	Geospatial Info	Mar 1999	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	<u>COMMUNICATIONS</u>																							
JP 6-0	Jt C4 Systems	Mar 2006	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	R	R	R	R
	<u>PLANNING</u>																							
JP 5-0	Joint Ops Planning	Apr 1995	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 5-00.1	Campaign Planning	Jan 2002																	R	R	R	R	R	R
JP 5-00.2	JTF Planning	Jan 1999	G	R	R	R	R	G	G	R	G	R	R	R	R	R	R	G	G	R	R	R	R	R
	<u>LOGISTICS</u>																							
JP 4-0	JT Logistics		G	G	G	G	G	G	G	G	G	G	Y	Y	G	G	G	G	G	G	G	R	Y	R
JP 4-01	Defense Trans System	Mar 2003	R	R	R	R	R	R	G	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-01.2	Sealift Support	Aug 2005	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-01.3	JTTP for Movement cntl	Apr 2002	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-01.4	JTTP Theater Distro	Aug 2000	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-01.5	JTTP Trans Term Ops	Apr 2002	R	R	R	R	G	B	R	R	R	R	R	R	R	R	R	B	R	B	B	B	B	B
JP 4-01.6	Jt Log OTS	Aug 2005	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-01.7	JTTP for Container Use	Jan 1997	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-01.8	JTTP for JRSOI	Jun 2000	R	Y	Y	R	R	Y	Y	R	R	R	Y	Y	R	R	Y	R	R	R	R	R	R	R
JP 4-02	Health Support	Jul 2001	R	R	R	R	R	R	R	R	G	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-02.1	JTTP Health Logistics	Oct 1997	R	R	R	R	R	R	R	R	Y	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-02.2	JTTP Patient Movement	Dec 1996	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-03	Jt POL & Water	May 2003	R	G		R	R	R	R	R	R	R	R	R	R	R	R	R	R	G	R	R	R	R
JP 4-04	CE Support	Sep 2001	R	G	G	G	G	G	G	G	R	G	G	G	G	G	G	G	R	R	G	R	R	G
JP 4-05	Mobilization Planning	Jan 2006	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-05.1	TTP for Reserve Call-up	Nov 1998	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-06	Mortuary Affairs	Aug 1996	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-07	JTTP for CUL	Jun 2001	G	G	G	G	G	G	G	G	G	R	G	G	G	G	G	R	R	G	G	R	Y	G
JP 4-08	Spt of Multinational ops	Sep 2002	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 4-09	Global Distro	Dec 2001	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R

Joint Publications Analysis Summary (cont'd)

			BOS														Security	COMM	Airfield					
Doctrine	Subject	Date of Pub	Contracting	Messing/water	Water	Laundry/Bath/ Sanitation	Environmental	Engineering	MHE	EOD	Medical	NBC	Industrial	Road/rail	Storage	Utilities	Lodging	Base Security	Communications	Refueling	Crash/Fire/ Rescue	ATC	Weather	Lighting
	OPERATIONS																							
JP 3-0	Jt Ops	Sep 2001	G	R	R	R	G	G	R	Y	R	G	R	R	R	R	R	G	G	R	R	R	R	R
JP 3-01	Countering Air/Missile Threats	Oct 1999	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-01.1	Aerospace Defense of N.	Nov 1996	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-01.4	JTTP for SEAD	Jul 1995	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-01.5	Jt Theater Missile Defense	Feb 1996	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-02	Amphibious Ops	Sep 2001	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-02.2	Amphibious Embarkation	Apr 1993	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-03	Jt Intrediction Ops	Apr 1997	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-04.1	JTTP for Shipboard Helo Ops	Dec 1997	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-05	JT Spec Ops	Dec 2003	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-05.1	JTTP for JSOTF Ops	Dec 2001	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-05.2	JTTP--SOF targeting/mission	May 2003	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-06	Jt Urban Ops	Sep 2002	R	R	R	R	Y	R	R	R	R	R	R	R	R	R	R	Y	R	R	R	R	R	R
JP 3-07	Jt MOOTW	Jun 1995	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-07.1	JTTP for FID	Apr 2004	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-07.2	Antiterrorism	Apr 2006	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-07.3	JTTP for Peace Ops	Feb 1999	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-07.4	Jt Counterdrug Ops	Feb 1998	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-07.5	JTTP for NEO	Sep 1997	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-07.6	JTTP for Foreign HA	Aug 2001	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-08	Interagency Coord	Mar 2006	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-09	Jt Fire Support	May 1998	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-09.1	JTTP for Laser Ops	May 1999	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-09.3	JTTP and Procedures for CAS	Sep 2005	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-10	JT Rear Area Ops	May 1996	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
JP 3-10.1	JTTP for Base Defense	Jul 1996	R	R	R	R	G	R	R	R	R	R	R	R	R	R	B	R	R	R	R	R	R	R
JP 3-11	Jt Ops in NBC Environments	Jul 2000	R	R	R	R	R	R	R	R	G	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-13	Information Ops	Feb 2006	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-14	Space Operations	Aug 2002	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-15	Barriers, Obstacles and Mines	Feb 1999	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-16	Multinational Ops	Apr 2000	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-17	JTTP for Air Mobility Ops	Aug 2002	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	B	B	B	B	B
JP 3-18	Forceable Entry Ops	Jul 2001	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-26	Homeland Security	Aug 2005	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-30	C2 for Jt Air Ops	Jun 2003	R	R	R	R	G	R	R	R	R	R	R	R	R	R	R	R	R	G	R	G	R	R
JP 3-31	C2 for Jt Land Ops	Mar 2004	R	R	R	R	G	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-34	Engineer Doctrine in Jt Ops	Jul 2000	G	R		G	R	R	R	R	R	R	R	R	R	R	R	R	R	R	B	R	R	B
JP 3-35	Deployment & Redeployment	Sep 1999	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-40	Combatting WMDs	Jul 2004	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-50.2	Jt CSAR	Aug 2004	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-	JTTP for CSAR	Mar 1998	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-50.3	Evasion and Recovery	Sep 1996	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-51	EW	Apr 2000	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-52	Airspace Control in Combat	Aug 2004	R	R		R	R	R	R	R	R	R	R	R	R	R	R	Y	R	R	R	R	R	R
JP 3-53	Psychological Ops	Sep 2003	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-54	Operations Security	Jan 1997	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-57	Civil-Military Operations	Feb 2001	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Y	R	R	R	R	R	R
JP 3-57.1	Jt Doct for Civil Affairs	Apr 2003	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-58	Military Deception	May 1996	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-59	JTTP--Meteorological/Ocean	Mar 1999	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-60	Targeting	Jan 2002	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
JP 3-61	Public Affairs	May 2005	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R

Blue--includes airbase operations specifics/procedures
Green--includes specifics but no mention of airbase

B
G

●
●

Yellow--mentioned but no details included
Red--no mention

Y
R

●
●

Before addressing each of the areas, command and control of a joint airbase should be addressed. There is limited information in joint doctrine on the command and control relationships at joint airbases. The *Joint Rear Area Operations Doctrine*, JP 3-10, dictates that the commander of a base is determined based on whether the base is considered single service or a joint base and the functions assigned to the individual

services. This provides the joint forces commander the latitude to appoint the base commander based on the functions of the base.⁷ For example, a joint airbase commander should be an airbase expert versus a sea port expert. Command and control of joint airbases is a vital area that must be covered adequately in joint doctrine. The implications not addressing the roles and responsibilities of the command and control structure of a joint airbase reach from initial airbase opening operations to stability operations long after major combat operations are concluded.

Base Operating Support

The category of BOS is broad and diverse. Three BOS elements (airfield, security, and communications) are addressed independent of the overall category of BOS to enhance the thesis' joint doctrine analysis. Even with those three areas removed, the remaining portions of BOS are vital to successful airbase opening operations. Joint doctrine addresses portions of a number of BOS elements across publications but there is not a single joint doctrine document that consolidates all the elements into one publication. JP 4-0 is the overarching doctrine that could include some airbase operations details but currently it has very little on airfield operations. There are many elements that make up BOS to include: contracting, food, water, laundry, bath, sanitation, environmental, engineering, Explosive Ordnance Disposal (EOD), medical, nuclear biological chemical defense, road, rail, storage, utilities, and lodging. JP 3-10, *Joint Rear Area Operations*, provides the majority of guidance with respect to BOS responsibilities and procedures. However, there are at least thirteen joint doctrine documents that contain some guidance about BOS elements.

JP 1-06, *Joint TTP for Financial Management*, during Joint Operations, includes information applicable to base contracting. There is an entire appendix on contingency contracting which is most appropriate for airbase opening operations. Contingency contracting includes the ability to conduct contracting with foreign governments, commercial entities, nongovernmental organizations, and private volunteer organizations. When conducting airbase opening operations contracting will almost always be required for some support and competent contingency contracting is a force multiplier.⁸

Joint planning doctrine, JP 5-00.2, *Joint Task Force (JTF) Planning Guidance, and Procedures*, contains references to multiple elements of BOS. It includes the responsibility of the Joint Rear Area Coordinator with particular emphasis on security including nuclear, biological, and chemical weapon defense. It describes the critical role of the J-4 in the planning of JTF operations. The J-4 at the JTF level is responsible for almost all elements of BOS. Therefore planners of both airbase opening and overall joint operations must work together to ensure that the airbase opening operation is executable and any questions identified before the operation are addressed.⁹

Identifying contracting requirements is specifically mentioned as a responsibility of the JTF J-4. Coordinating airport operations within the joint operating area is also listed as a key responsibility of the JTF J-4. It also states that joint logistics should use individual service policies and procedures. If there are differences, they are to be identified to the combatant commander as early as possible. When planning joint airbase operations identifying the differences should be an output of the JTF planning process to ensure differences are resolved before operations take place. This is integral in the prevention of confusion once joint airbases are opened and support relations have to be

developed ad hoc. The doctrine document details that as part of logistics planning engineers determine the capabilities of the existing infrastructure and develop plans as needed. Lastly, the planning doctrine introduces the joint facilities utilization board as the party responsible to reconcile real estate and interservice support requirements.¹⁰

In the 4-0 series of JPs, BOS elements are addressed in a number of joint doctrine documents. In 4-01, *Defense Transportation System*, the importance of Materials Handling Equipment (MHE) is established in both aerial and sea port operations. The *Doctrine on Joint Reception, Staging, Onward Movement, and Integration (JRSOI)*, JP 4-01.8, includes the requirements for engineering, water, handling equipment, road, rail service, storage, and medical. The requirements listed are focused on JRSOI operations which could be at an airbase but are not necessarily at every airbase.

JP 4-01.5, *Transportation Terminal Operations*, includes the requirement for engineering support in areas such as lodging and facilities upgrade. Of note, there is an entire annex dedicated to environmental planning considerations. It specifies that when conducting operations outside the US in the absence of definitive guidance the geographic combatant commander must establish plans consistent with mission goals, protect health of troops, and consider potential US liability.¹¹ Environmental requirements are another key area that airbase opening operations must comply with. Each country and even localities within the country can have different requirements that may effect procedures, materials or even operations.

Health requirements are in two joint doctrine documents: JP 4-02, *Health Service Support in Joint Operations*, and JP 4-02.1, *Joint TTP on Health Logistics*. The doctrine is clear about using all available medical capabilities regardless of the service providing

the care. The overall purpose of health service support is to: “minimize the effects of wounds, injuries, diseases, environmental and occupational hazards, and psychological stressors on unit effectiveness, readiness, and morale.”¹² Health service support is one common user logistics capability that almost always is considered a true joint resource. At any joint airbase, the surgeon general of the responsible JTF would synchronize health service support resources. During airbase opening operations, health service support must be accounted for either with organic capability or through interservice agreements.

Civil engineering support is a key component of airbase opening operations. Joint doctrine on civil engineering support is found in JP 4-04, *Civil Engineering Support*, and JP 3-34, *Engineer Doctrine for Joint Operations*. While there is information relating to airbase opening operations, JP 3-34 focuses on runway construction and repair. JP 4-04 is the focal point for BOS related civil engineering activities. Initial base development operations are clearly identified by doctrine as to:

Develop and establish water supply points, field latrines, and sanitation systems; Provide mission-essential electrical power; Establish basic physical defensive and force protection construction support measures; Establish fire fighting and protection capability; Establish operations support, e.g., mobile aircraft arresting systems; Prepare site plans for facilities, billeting, roads, and utility systems.¹³

This guidance is clear and addressed during airbase opening operations. Depending on the location, the solution to each of these requirements could be different. For example, water supply at a bare base may be trucked in whereas water at an existing civilian airfield may be from the existing water supply.

The second area in JP 4-04 that is applicable to joint airbase operations is the joint facility utilization board. This board is charged with reconciling real estate requests and modifications of the services. This board can be at the joint task force or combatant

command level. What is not clear in the doctrine is the relationship between a joint base commander, the individual services, and the real estate utilization board. Inherently, the base commander controls the facilities at the base. However, per doctrine, each service could submit through their component commander facility requests to the joint task force or combatant command. This could result in two different modifications or uses requested to the same facility.

While JP 4-04 describes the detailed requirements for civil engineering support and JP 4-02 details health service support, JP 3-10 lists base tenant commanders responsibilities which can cause problems at joint bases especially if some support capabilities redundant between services. Tenant commanders are charged to: provide housing to forces under their command, provide communications systems within the command, and to provide health service support for forces under their command.¹⁴ Every commander understands that taking care of their forces is a basic requirement they always have. However, the wording in JP 3-10 can cause tenant commanders to build a duplicate capability in many areas. This can lead to an inefficient use of critical resources especially when force levels are of particular concern to a host nation or the national command authority. There is joint doctrine to minimize the occurrence of duplication between the services.

Common user logistics is covered in detail by JP 4-07, *Joint TTP for Common User Logistics*. The overall purpose of common user logistics is to “provide prompt, efficient, and unified logistic support that enhances the deployability and combat effectiveness of the joint force.” It is defined as the material or service provided by one service or multinational partner to multiple services or multinational partners. It is usually

a particular type of supply or service, but can be directed to apply to a specific location (such as an airbase) as well. This doctrine document addresses each class of supply and the applicability of common user logistics.¹⁵ It is a valuable tool when planning airbase opening operations especially when combined with other joint doctrine that details what must be considered when establishing or operating bases. Common user logistics recommendations are made by the J-4 to the Joint Forces Commander which strengthens the requirement for airbase opening operations planners to interact with the J-4.

Service doctrine applicable to BOS operations include the Army's FM 4-0, *Combat Service Support* and Air Force Doctrine Document (AFDD) 2-4, *Combat Support* and AFDD 2-4.4, *Bases, Infrastructure, and Facilities*. AFDD 2-4 contains the overall AF concept of Agile Combat Support which is the ability to create, protect, and sustain air and space forces across the spectrum of military operations. One of the Agile Combat Support capabilities is establishing operating locations. In AFDD 2-4 it is defined as:

Planning, reconfiguring or building a supportable infrastructure to support personnel and equipment at a specific locality from which operations are projected or supported. Fundamental requirements include providing operating location assessments that address the following infrastructure items: runways, taxiways, ramps, roads, and building sites; utility grid(s); communications grid(s); aviation fuels grid(s); munitions storage area(s); and facilities.¹⁶

This definition is very similar to the requirement levied in JP 4-04 on joint civil engineering support.

Figure 3, from AFDD 2-4, provides a comprehensive look at the Air Force's Agile Combat Support encompasses.

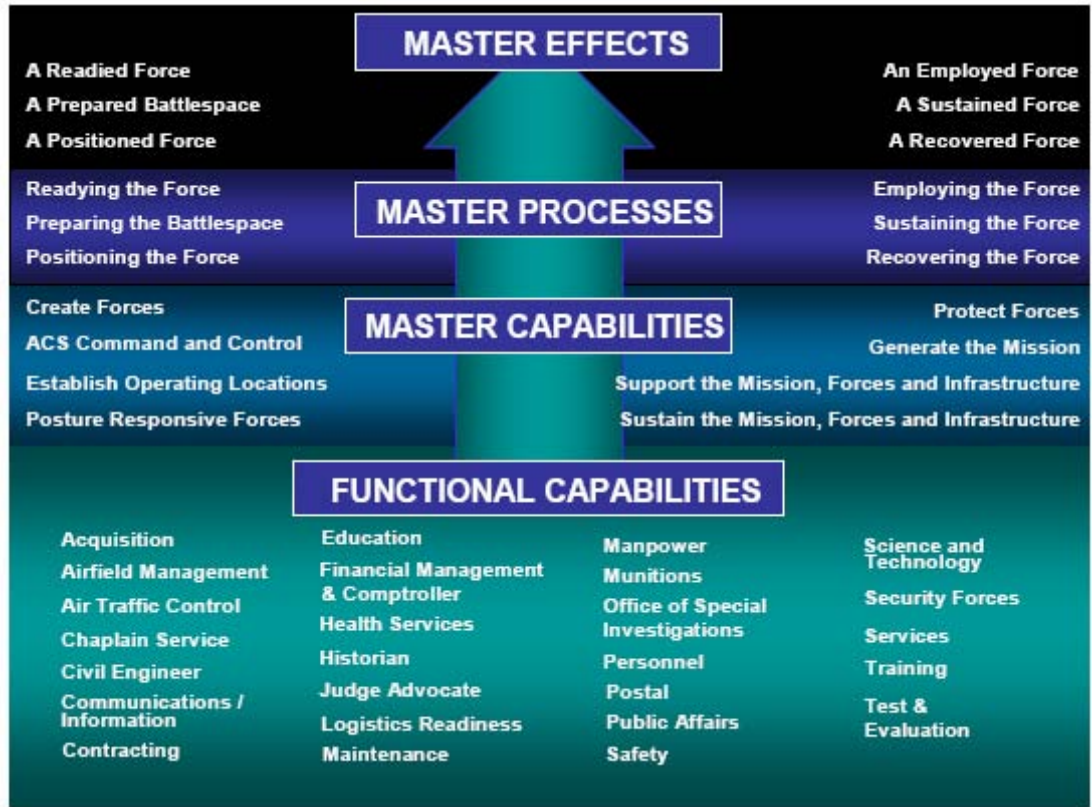


Figure 3. Agile Combat Support Overview

Source: Headquarters, Department of the Air Force, AFDD 2-4, *Combat Support* (Washington, DC: Government Printing Office, November 2003), 2.

AFDD 2-4.4 provides greater level of detail regarding bases, infrastructure, and facilities. Furthermore, it is currently under revision which includes a name change to “Base Establishment and Mission Generation.” In the draft, the changes to AFDD 2-4.4 are numerous as it now incorporates an entire section on opening an airbase. This doctrine document includes the concept of a Senior Airfield Authority, the use of AF Contingency Response Groups (CRG), airfield ownership transfer, and the stages of airbase opening. It sets the four stages as: runway open, airfield open, airbase open, and airbase established. While this puts into doctrine the CRG concept that has been

developed, refined, and utilized in one form or another since 1999 in Albania, this draft does not include much information on how the AF doctrine integrates with joint doctrine. This integration is key to successful airbase openings considering most airbases located forward are joint airbases.

Airfield

At the core of airbase operations is of course the airfield and its related activities. Most of the doctrine regarding airfields relates to runway repair, air traffic control, and air defense aspects of airbase operations. Areas within the ground airfield operations umbrella include fuel, crash, fire, rescue, runway and taxiway maintenance, air traffic control, weather, lighting, and material handling equipment. There are a number of joint doctrine documents that contain different portions of airfield operations from joint civil engineering doctrine to transportation terminal operations doctrine.

There are six different joint doctrine documents in the 4-0 series that contain information relevant to airfield operations. JP 4.01, *Defense Transportation System*, contains the concept that there is a single port manager to ensure that the flow of deploying and redeploying troops and equipment remain unimpeded. This includes the MHE required to load and unload aircraft. This single port manager at airbases with multiple uses may not control the entire airfield but will control the area and equipment required to accomplish the mission. The concept of a single port manager is similar to and predates the concept of a SAA outlined in the literature review. Just as the single port manager may not command the entire airfield, but control all port activities, the SAA may not command everything on base, but yet they are the single point of contact for issues relating to airfield operations.

The *Joint TTP for Transportation Terminal Operations*, JP 4-01.5, explains in greater detail all the areas of airfield operations. It includes a chapter devoted to air terminal operations. The key points from this JP are the command and control relationships that are detailed for the air terminal. As was stated above in reference to JP 4-01, there are concepts that when expanded and applied through the appointing of a SAA are very applicable to airbase opening operations.

JP 4-01.5 states, “When an operation involves multiple components, the geographic combatant commander should appoint a single component to coordinate with the host facility, decide resource allocation, and prioritize on-load and off-load operations.” This is very similar to the role of a senior airfield authority but applied to the overall operations at a joint airfield. The document includes guidance on how operations at joint aerial port complex are broken down into “air terminal” operations and “support” operations. It details how Air Mobility Command runs the “air terminal” operations and typically the supported component command runs the support operations.¹⁷

This concept appears to have been the basis for the US Central Command’s guidance to the bases located in their area of responsibility. They split the overall responsibilities of the base into the Base Operating Support-Integrator and the SAA. The SAA controls operations of airfield related activities and the BOS-Integrator controls the support operations that are required by all. JP 4-01.5 stresses the requirement in the planning and execution of air terminal activities of fuel, lighting, weather, and crash, fire, rescue capabilities. JP 4-01.8, *Joint TTP for Joint Reception, Staging, Onward Movement, and Integration (JRSOI)*, complements the terminal operations publication. It contains information on the handover from the terminal operators to the supported

commander. The reception chapter includes a recap of air terminal operations responsibilities compared to the supported commander's responsibilities which mirror what is included in the air terminal document.

The second major area for airfield operations in joint doctrine is civil engineering support, JP 4-04. Advance base development which includes runway assessment, repair, and maintenance as well as lighting capabilities is considered a civil engineering primary mission area. Crash, fire, rescue capability is considered by doctrine to be a specialized engineering support activity. The document stresses the importance of including civil engineering expertise in the planning of operations. This is especially true of airbase opening operations. Civil engineering expertise is required from the initial assessment of the runway to power support for airfield activities to lighting of the runway, taxiway, and ramps to crash, rescue, and fire protection during airfield operations.¹⁸

Surprisingly, there was information regarding airfield operations in JP 4-07, *Joint TTP for Common User Logistics*. One might not think of this doctrine as a document which would contain airfield operations information. Arguably the most important BOS element to generate combat sorties is the refueling capability at the airbase. An executable plan must be developed to determine when and where to open airbases. Fuel is normally a common user logistics resource. Airbases can utilize host nation support with respect to fuel or receive direct support from the executive agent, the US Army. Once the fuel is at a joint airfield the retail aspect of fuel support must be coordinated. One service may provide service to multiple services - nations or each may have their own retail fuel capability. JP 4-03, *Joint Petroleum and Water Doctrine*, contains limited information

regarding airfield operations. Its focus is the bulk aspect of petroleum management, getting the fuel to the airbase.

In the operations series of JPs, there is only fleeting reference to airfield operations. JP 3-17, *Joint TTP for Air Mobility Operations*, has the same guidance with respect to command and control of joint airfields as JP 4-01.5. In JP 3-30, *Command and Control for Joint Air Operations*, there is limited guidance about logistics concerns. Specifically, it states that in the Joint Air Operations Plan that petroleum and other joint services responsibilities should be detailed in paragraph four of the plan.¹⁹ *Engineer Doctrine for Joint Operations*, JP 3-34, contains similar information as that found in JP 4-04. It focuses on the construction, repair, and operations (lighting, crash, fire, and rescue) of airfields during expeditionary operations.

In the service doctrine documents, as expected, the AF has the most developed doctrine relating to airfield operations. AFDD 2-4.4, *Bases, Infrastructures, and Facilities*, contains information on all areas of airfield operations. It identifies the primary elements of an airbase such as fuel, lighting, and air traffic control aids. From an airfield operations perspective, it identifies everything that must be addressed during airbase planning and execution. The draft revision of AFDD 2-4.4 increases the level of detail of airfield operations in AF doctrine. Every area of airfield operations is refined based on the experiences of the OEF and OIF.

Security

The security portion of joint operations is the most comprehensive component of joint base doctrine. It covers the range of activities through the JP 3-10, *Joint Rear Area Operations*, and JP 3-10.1, *Joint TTPs for Base Defense*. The focus on the defense of

joint bases starts in JP 3-0, *Joint Operations*, with mention of the Joint Rear Area Coordinator. There are a total of ten JPs that address the security of bases. They range from general planning doctrine to specific joint tactics techniques and procedures for base defense.

Within the 4-0 series of joint doctrine documents there are three documents that contain references to base defense. The *Joint Doctrine for Civil Engineering Support*, JP 4-04, contains the requirement to establish basic physical defense and force protection construction support measures. These measures can include hardening facilities, constructing barriers, creating redundant utility systems, and facility concealment. In support of base defense, the doctrine details the requirement for area damage control planning with respect to actions taken before, during, and after an attack.²⁰ The connection between civil engineering support and base defense is vital to successful base defense operations. This joint doctrine document does not specify any additional requirements for the civil engineering support to airbase defense.

The other two logistics related joint doctrine documents that contain information on base defense requirements are joint TTPs. JP 4-01.8, *Joint TTP for JRSOI*, contains information on the vulnerability of troops at staging bases and the importance of force protection at airfields serving as aerial ports and staging bases. JP 4-01.5, *Joint TTP for Transportation Terminal Operations*, contains specific guidance with respect to airbase operations in the context of aerial port operations. This guidance details a list of force protection functions that should be included such as aerial port facility defense, the establishment of an operations center for security operations, perimeter defense, and passive air defense.²¹ These functions must be accomplished when performing airbase

opening operations to establish an aerial port or to establish an airbase from which strike missions will be flown.

There were six doctrine documents within planning or operations that have some mention of base defense. JP 5-00.2, *JTF Planning*, describes the role of the Joint Rear Area Coordinator with respect to their responsibility to ensure that joint rear area and base defense preparation is sufficient. JP 3-06, *Joint Urban Operations*, describes the importance of conducting security and threat analysis of airfields, since they typically are located in or near major population centers. JP 3-52, *Airspace Control in Combat Zone*, introduces the base defense zone as the air defense zone around a base. However, it does not extend the discussion to the relation of the base defense zone with the requirements of ground based operations in support of airbase defense. Within JP 3-57, *Civil-Military Operations*, the Joint Forces Commander is defined as needing to be prepared to provide security to airfields within the heading of “other personnel and assets.” This is focused on civilian airfields which are integral key during civil-military operations conducting international aid receiving and distribution. Frequently, there will be a joint or even multinational force staging operations from the same airfield during civil-military operations. There may be a need to open the airbase to establish operations but normally there is a commercial airfield that is utilized for the operation. The extent of the discussion of security as it relates to joint airbase opening from the JPs above is fairly limited. The remaining two joint doctrine documents in the operations area provide the most detail of base defense operations.

The two joint documents that detail the requirement of airbase security requirements are JP 3-10, *Joint Rear Area Operations*, and JP 3-10.1, *Joint TTP for Base*

Defense. JP 3-10 provides the joint guidance on rear area operations in a joint environment. It includes detailed explanations of the Joint Rear Area Coordinator as the individual with overall responsibility for all security related planning within the joint area. It also contains an entire section on base defense operations. It dictates that bases and base clusters are the “fundamental blocks” for planning, coordinating, and executing base defense operations. Individual services still have the responsibility to organize, train, and equip their forces.

Base commanders have the ultimate responsibility for base defense. They must establish a Base Defense Operations Center (BDOC) to serve as the focal point for security and defense. If there is a base cluster involved then the base cluster commander must set up a base cluster operations center as well. Current doctrine stipulates that forces from each component that are assigned to the base for the primary purpose of providing base defense will be under the operational control of the base commander. Forces that are at the base for purposes other than base defense will support the overall base defense plan in times of imminent attack. Due to the fact that there are many transient forces at a normal joint rear area base, there is guidance on how to integrate those forces into the overall base defense plan. More importantly, there is guidance for the individual component commanders regarding base defense. This is extremely vital when there were so many bases in OIF and OEF that had multiple components collocated. The responsibilities include participating in base defense planning, providing essential personnel for the BDOC, providing liaison personnel to advise base commander on peculiarities of that component’s requirements and ensuring the internal defense of the component’s command.²² A number of these are key for airbases. The liaison function is

vital when communicating the unique nature of airbase security concerns compared to a ground force-only forward-operating base. Through the liaison and participation in the base defense planning effort airbase concerns can be addressed.

The most specific joint doctrine document on base security is 3-10.1, *Joint TTP for Base Defense*. This document goes in detail restating the command and control relationship of base defense. The majority of the information on base defense command and control reiterates what is in JP 3-10. It goes into more detail on the type of threats a base may face. It also shows multiple command and control figures which help the reader visualize the wording that was in JP 3-10. It restates the tenant commander responsibilities with more detail listed for each of the key elements mentioned in the paragraph above. There is no mention in JP 3-10.1 of opening a base or specific details for airfields beside a brief mention in the BDOC description.

There are two Air Force specific doctrine documents relating to security. Air Force Doctrine Document (AFDD) 2-4.1, *Force Protection*, and AFTTP 3-10.1, *Integrated Base Defense*. Both build upon the information that resides in JP 3-10.1 and JP 3-10. There are a number of key items in AFDD 2-4.1 that do not reside in joint doctrine. The Air Force document includes the extensive use of the term Integrated Base Defense. It is defined as offensive and defensive action both active and passive across the force protection battlespace to achieve local and area dominance.²³

In AFDD 2-4.1, the notion was introduced that integrated base defense extends beyond the perimeter of the airbase. This is a key concept when conducting joint operations as there must be coordination across the components and battlespace owners. There is specific wording in the AF doctrine document that “it is incumbent on the

geographic combatant commander to identify that area of operations surrounding the installation for which the base commander is responsible.”²⁴ This concept is perfectly consistent with the concept of integrated base defense. However, there is no specific mention in JP 3-10 or JP 3-10.1 that the geographic combatant commander would identify that area surrounding the base to be owned by the base commander. There is a requirement in joint doctrine that specifies that area commanders subdivide their area of operations. It also specifies that land areas are normally assigned to Army or Marine Corps forces. There is guidance in JP 3-10.1 that component and area commanders must ensure that area of operations assigned to base commanders include the amount of area required to conduct successful defensive operations. In the joint doctrine document guidance about base cluster commanders, there is a direction to integrate individual base defense plans into the overall area defense plans. From a doctrine perspective, the concept of area around an airbase needs to be further refined with respect to the responsibilities of the airbase commander outside the perimeter of the base.

The Air Force doctrine document also details that the surface-to-air-missile footprint must be considered as part of the integrated base defense. This concept is crucial to protect aircraft and personnel both arriving and departing an airbase. Since most of United States military operations take place in sovereign nations, Air Force doctrine stresses that rapport and mature relationships with host military and civil organizations are an integral part of ensuring the safety of airbase assets. This doctrine document is also the first one to include the concept of Contingency Response Groups as they relate to airbase security issues. It stresses that force protection must be done for

airbase openings; however, there is no mention of accomplishing this in a joint environment.

The Air Force TTP on Integrated Base Defense goes into great detail regarding capabilities essential to integrated base defense. It also describes in further detail the reasons why the area around an airbase is also a key concern of the airbase commander and those charged with base defense responsibilities. It specifies that commanders should ensure that their area of influence around the base includes the area from which mortars, rockets and man-launched missiles can affect the operations at the base. It also emphasizes the importance to conduct liaison activities with adjacent friendly forces such as other services, multinational force, and local police.

An Army doctrine document that contains base defense information is FM 4-93.4, *Theater Support Command*. This field manual includes an entire chapter on the role of the theater support command in force protection. It includes details on rear area and base security. The chapter contains much of the information in JP 3-10 with additional information on threats and detailed information on protective measures units should take. There are also details on base and base cluster defense planning and responsibilities with Army requirements in addition to the requirements in joint doctrine. There is nothing specific about airfield security in this field manual. FM 3-19.1, *Military Police Operations*, contains information on the threats and basic considerations of rear area operations. It does not contain the level of detail found in FM 4-93.4 or JP 3-10. It only mentions a number of the concepts whereas the previous documents go in much greater detail.

The primary joint doctrine document which includes base security requirements is under revision and the draft document shows the effects of today's environment. The changes start with the title. The title changes from *Joint Rear Area Operations* to *Joint Security Operations in the Theater*. There are significant changes throughout the document and it does include airbase considerations such as the importance and challenge of protecting aircraft approach and departure routes. It also includes wording about setting the boundary of a base. Of note, it specifies that the base boundary does not necessarily mean perimeter. It is dependant on the situation balancing the need to defend the base and the ability of the assigned base defense forces. There is an entire section on airfield defense to include threats, planning and execution of defense operations. Both of these items reflect the adaptation of US joint doctrine based on the experiences of operations in OIF and OEF.

As shown in this section, doctrine on base defense operations in a joint environment are among the most developed of all joint doctrine effecting airbase opening operations. As shown in the discussion of the draft JP 3-10, doctrine is continuing to evolve to the benefit of joint airbase operations. The changes indicated in the final draft version if implemented as written guarantee the success of future joint airbase operations throughout the world.

Communications

Communications is vital to successful operations. It provides forces the ability to be flexible and decisive. The joint doctrine on communications is the 6-0 series joint doctrine documents. Individual components are very competent in establishing the communications that their operations require. However, in joint operations

communication capabilities have always been a challenge. In airbase opening operations the communications system is an aspect that must be planned for up front and synchronized with other units located at the airbase.

JP 6-0, *Joint Communications System*, is the overarching joint doctrine document for communications. The doctrine document covers three main areas the global information grid, joint force communications system planning and management, and network operations. The global information grid and joint force communications systems planning are the two areas that are important to airbase opening operations. The global information grid is the globally interconnected information capabilities that are available to joint forces on demand.²⁵ These capabilities exist at the strategic, operational, and tactical level.

Within the realm of airbase opening operations, JP 6-0 provides a few key pieces of information. The first being that communications systems and the availability of the global information grid to the joint force is intended to be available at every level from well established main operating bases to bare base camps. The appropriate joint forces commander J-6 has overall responsibility to integrate theater communications systems. JP 3-10.1, *JTTP for Base Defense*, dictates that tenant commanders must provide their communications requirements to base communications agency and the planning of base defense communications is vital. JP 6-0 also specifies that during planning interoperability, compatibility, and supportability must be addressed. This is important for joint airbase operations to ensure there are no frequency management issues, that equipment and systems are used most efficiently and to ensure that base defense activities are not hindered by incompatible equipment. The joint doctrine document prescribes that

when units are collocated the planners should use the communications system assets of one unit to cover the requirements of another unit.²⁶ This reinforces the need during planning of joint airbase operations for communications system interoperability and robustness to be fully evaluated and ensured.

Within Air Force doctrine there is a similar emphasis on the importance of communications systems. AFDD 2-4.4, *Bases, Infrastructures, and Facilities*, lists communications as a primary element of an airbase. It is also considered part of the infrastructure of a base. It further states that the commander should “maintain interoperable, secure, reliable, flexible, and survivable intertheater and intratheater networks to accomplish the mission.”²⁷ There is a consistent presence of communications in the document across the entire expeditionary airbase planning spectrum. This current Air Force doctrine is under revision and the draft of the AFDD 2-4.4 includes similar emphasis on the importance of communications to airbase opening operations. This is further demonstrated by the importance of the communications system in the contingency response group concept of operations and the agile combat support concept of operations. In today’s operating environment, all airpower operations rely on part or all of the communications systems as defined in the JP.

Base Operating Support, Senior Airfield Authority,
Air Base Ground Defense Doctrine

The information gathered above provides the information to answer the following secondary research question: Is BOS, SAA, and airbase ground defense doctrine and guidance sufficient? When BOS is examined by its components as described in this thesis BOS doctrine and guidance is fairly comprehensive. This should not be a surprise since

the military has been conducting expeditionary operations for a long time. Food, water, fuel, lodging, engineering, etc. are not new issues. Most of joint doctrine is based on the overall concept that logistics is a service responsibility. This works well when the bases are single service, single mission focus bases. However, today's operating environment has resulted in a number of joint airbases. BOS doctrine concerning operations of these joint airbases needs to be improved. The foundation of the changes needed is in the common user logistics doctrine document.

Overall, SAA doctrine and guidance is clearly insufficient. There is no mention of the responsibilities of a SAA anywhere in joint doctrine. However, there is doctrine that covers many of the elements under the airfield umbrella to include fuel, MHE, crash, fire, rescue capabilities, and air traffic control. It is not centralized in any one JP nor is it currently assigned as an airbase commander's responsibility. The most common complicating factor of airfield operations occurs at a joint base where the priority and experience of the base commander may not be airfield operations. Once the draft AFDD 2-4.4 is finalized it promises to provide sufficient SAA doctrine for AF use. The next task becomes getting the AF doctrine implemented into joint doctrine.

Airbase ground defense doctrine and guidance is the most sufficient of the three elements of this question. There are two comprehensive joint doctrine documents that address this element. JP 3-10 and JP 3-10.1 provide a solid foundation for establishing and protecting bases. The military's experience in OEF and OIF identified areas in airbase defense that need to be improved based on the threats and tactics of the enemy. The changes of airbase defense from inside the perimeter only to an area of influence as

detailed in the new draft of JP 3-10 will fix the areas needing improvement in airbase defense doctrine.

Tactics, Techniques, and Procedures on Airbase Opening Operations

The last of the doctrine related secondary questions is: do any gaps exist in TTPs regarding airbase openings? From a doctrine review perspective it is clear that airbase opening TTPs do not exist in a consolidated manner. There are elements of airbase opening that do exist in some TTPs such as base defense in JP 3-10.1, common user logistics support in JP 4-07, planning in JP 5-00.2, transportation terminal operations in JP 4-01.5, and air mobility ops in JP 3-17. However, one must scour the documents and put together the pieces making interpretations along the way for airbase operations. Very little of the information in these joint TTPs is specific to either airbase opening or even airfield operations. The items that are specific to airfields primarily focus on the aerial port and the transportation of troops, equipment, and supplies. This is understandable considering that during the Cold War almost every base was single service and therefore joint airbase doctrine was not needed except where the services coexisted such as in JRSOI operations. The fact that much interpretation and the piecemeal of doctrine together is required to cover airbase opening operations indicates that there is a gap in joint TTPs and until AFDD 2-4.4 is finalized there is also a gap in AF TTPs regarding airbase opening operations.

Case Studies

Since the events of 11 September 11 2001, the US has been involved in operations throughout the world. These operations resulted in a number of airbase

opening operations. They range the spectrum from a permissive environment during the Liberia Noncombatant Evacuation Operation (NEO) in July 2003 to forced entry airbase opening in Afghanistan to rapid airbase opening in Afghanistan and Iraq. These operations provide a superb opportunity to review the details of establishing the airbases and their initial operations.

The three secondary questions that relate to information from the case studies are as follows: what airbase opening operations procedures were used during OEF and OIF? Second, did the US military deviate from existing doctrine regarding airbase opening operations during OEF and OIF? Third, do case studies of US airbase opening operations provide pertinent lessons learned? These questions are discussed after presenting the case study information. The case study information will be split between single service airbase operations and joint airbase operations.

The case study information, when possible, will be broken down into the following phases and timelines: planning (prior to any operations at the airfield), initial setup (from seizure to airfield open), initial operations (from airfield open to airbase open which is approximately thirty days), and the transition to long-term operations (the time after the airbase is open).

Single Service Airbase Opening Operations

The first airbase opening operation is a single service airbase opening operation. It is the NEO of Liberia by the 56th Rescue Squadron (RQS) stationed in Iceland and 86th Contingency Response Group (CRG) based in Germany. As the only HH-60 helicopters assigned to US Air Forces-Europe, the 56th Rescue Squadron proved itself to the 3rd Air Force during a rapid deployment to conduct force protection operations

during OIF (March-May 2003). When the situation in Liberia led to the decision that the US would conduct a NEO of its personnel, European Command reached out to the 56th RQS and the 86th CRG which had plenty of experience in rapid deployment operations.

The planning of the airbase opening operations was limited by the amount of time between notification and departure. There was less than 96 hours notice given prior to deployment. Based on conditions in Liberia, it was decided that Freetown International Airport in Sierra Leone would become the base for the helicopter operations. Planning for the base opening operation was limited. There was a small amount of information available about the airport augmented with imagery and the Air Mobility Command planners tool kit which covered fuel, lighting, runway surface, and aircraft suitability. There was no information regarding BOS available at the Freetown International Airport. The plan was to have the 86th CRG arrive four hours ahead of the 56th RQS main body. This was due to the permissive environment of a functioning civilian airport.

The initial setup of US forces was performed by 86th CRG. They established limited communications, fuel support, lodging, security, and MHE. They brought food for five days and acquired transportation in the form of locally contracted trucks. In less than 16 hours, USAF forces arrived and established airfield operations with operational HH-60 helicopters. Personnel and aircraft were now in place and ready to conduct operations. The initial planning factor called for less than thirty days of US operations.

The initial operations included a number of BOS and airfield related issues. Additional billeting was required and secured after seven days. Fuel was an issue that effected operations. Fuel was procured locally and resupply was via a truck that came on a ferry. On several occasions the ferry cancelled causing the 56th RQS helicopters to take

off with minimal fuel and requiring air refueling almost immediately. To preclude this from happening again in the future, the 56th RQS helicopters began air refueling immediately prior to landing at the airport. Food eventually was procured on the local economy as well as morale items. Communications systems were expanded from a system with only phone two lines and limited bandwidth to a deployed satellite communications suite greatly expanding the deployed communications capabilities. Cell phones were also procured on the local economy as there was no landline phone network.

There was no transition to long-term operations in Sierra Leone. All operations for the US Air Force were complete on about day 40 of the operation. Redeployment to Iceland and Germany for 56th RQS and 86th CRG occurred on day fifty-five. Security for the operation was adequate as no one traveled unarmed and there were security personnel stationed at the airfield and billeting locations. When reviewing the operations in Sierra Leone, there are a number of areas that were discussed in the doctrine section of chapter four. Everything from food to lodging to contracting to security to fuel had to be properly addressed to ensure a successful NEO in neighboring Liberia.²⁸ This example shows that setting up a single service operation can be accomplished within the current joint doctrine but would be improved by including the AF CRG concepts.

A second case of single service airbase opening operations is the Camp Rhino seizure and airbase opening operations by the US Marines in OEF. The Marines conducted the longest amphibious airfield seizure in the history of the US Marine Corps traveling over 370 nautical miles. Planning for Operation Rhino included a number of issues relating to the airfield and in particular the runway. The runway was a 6000 ft dirt runway whose condition was less than ideal because of its hard clay and fine dust. The

runway was originally designed with light aircraft in mind not C-17s. There was a small raid in October 2001 that gathered key information about the airfield which was augmented by imagery and intelligence gathering.

On November 25, 2001 the Marines seized Camp Rhino and delivered the first conventional troops inside Afghanistan. Water was an immediate issue for all those who were deployed to Camp Rhino. In addition, the runway was the primary problem with over 800 landings conducted in five weeks. Security was a concern of everyone at Camp Rhino and numerous times the engineers would have to ditch their pick axes for a machine gun and defend their post. Communications systems were almost as important as the actual runway condition and proved to be a challenge for all. Every day the engineers spent all their time repairing the runway which every night would get torn up by approximately fifteen landings a night.²⁹ Within five days after the initial seizure of Camp Rhino, operations were in place that could sustain air and ground operations for the entire Marine Expeditionary Unit, quite a historic feat indeed.³⁰

Joint Airbase Opening Operations

Most of the rest of the airbases opened in the Afghanistan region were joint bases either for the entire time or at least during initial operations. The forces that collocated with AF units were both special operations forces and conventional land units. The challenges of joint airbase operations identified themselves rather quickly during OEF. This was due to the large number of new airbases all opening within a relatively short period. In less than six months, over ten bases were opened to support OEF operations.

The airbase located in Jacobabad, Pakistan was a key airbase opened to support OEF. Aircraft and operators deployed to Jacobabad and established operations prior to

when BOS was up and running. This caused problems with water, sanitation, and force health protection. A complicating factor regarding support at Jacobabad was the fact that support was switched from the Army to the Air Force at a late date. In addition to the health concerns, work was needed on the beddown site. The work included improvements to the runway, aircraft ramp, and numerous facility projects. Contracting was also extremely important and difficult due to the economics and culture of the host nation. It soon became obvious that host nation personnel did not have the initial capacity to provide the required support.³¹ This capacity included heavy equipment support among other items. This caused an increased reliance on organic engineering support to make the airbase compliant with standards. The fact that the base initially supported only USAF Combat Search and Rescue and US Special Operations Forces helps to explain why aircraft and operators were in place prior to BOS.

Khanabad Airbase, Uzbekistan, typifies the joint airbase experience in OEF and the issues that arose. Initially, the base had just cargo, combat search and rescue, and a clandestine special operations forces presence. The base's location was key since it was only 300 miles north of Kabul, Afghanistan. Again, due to the critical nature of the special operations forces and combat search and rescue, aircraft and operators found themselves at the base prior to BOS elements. This was compounded by the initial plan that the Army was to provide BOS to all assigned personnel. This changed to the AF at the beginning of OEF. Due to the short notice, problems ensued including sanitation, environmental, and fire protection. This was compounded by the reality that personnel at the base did not know what was coming on the next cargo aircraft or when it was scheduled to arrive. By January 2002, AF personnel accounted for only one in every

seven of the 3,500 troops at the base.³² The issues described above with joint airbase operations and BOS received a lot of attention from senior military leaders throughout OEF and provided the push to evaluate joint doctrine for any deficiencies.

Within Afghanistan, Kandahar Airbase became another example of the friction that can occur regarding BOS at joint airbases. Kandahar was initially designated to be an Army aviation center. Also, US Central Command designated the Army to provide BOS at both Kandahar and Bagram Air Base since the AF was providing BOS at the bases in the neighboring countries. EOD was a key capability that became utilized like a common user logistics capability. AF personnel with their expertise of airfield clearing operations and air-dropped munitions knowledge provided support that fell within the Army's BOS responsibilities. Another common user logistics capability was employed in a joint fashion at Kandahar as well. Engineer support for the maintenance of the airfield first was a Seabee operation and upon their departure AF civil engineers performed lasting repairs. Airfield operations at Kandahar were truly joint with AF providing initial fire protection and airfield lighting as well.³³

Overall, airbase opening operations during OEF were nothing short of amazing. The part of the airbase opening operation that took the most time was getting the country clearance to operate from a location and begin airbase opening operations. The difference is demonstrated by the difference between getting the first aircraft to Diego Garcia, in under a week, versus the first aircraft at Jacobabad, in approximately thirty-five days.³⁴ The lack of country clearances and site surveys complicated the airbase opening process.

The BOS responsibility was an after action report item for both the Army and Air Force. While most of the issues can be resolved via doctrine, the cultural difference

between the AF and the Army can cause confusion on what to expect. Billeting support by an Army unit would most likely be more austere than billeting support provided by an AF unit. Similar cultural differences exist for most other BOS elements. This is an issue of expectation management combined with a standardization of baseline capability of the services especially units that could find themselves collocated (e.g., aviation, combat service support, engineers). Due to the cultural difference it becomes more important that joint doctrine describe in enough detail the requirements if a service is tasked with providing BOS to another service or multinational partner.

As the United States moved onto OIF, airbase opening operations were again put to the test. Operations in Afghanistan caused a refinement of airbase opening procedures by the Air Force and BOS procedures by US Central Command. Additionally, there was a great deal more time available to plan airbase opening operations in Iraq than Afghanistan. Third, the physical environment in Iraq was different than the one faced in Afghanistan. The continuous improvement of CRG operations was key to the successful airbase opening operations in OIF. The airbase opening operation of Tallil Airbase is the most detailed case to look at but there were six other airbase opening operations in Iraq.

Planning to utilize a forward airbase inside Iraq began early but the specific airfield was not known. The reasons that Tallil was chosen to become a forward airbase centered on shortening the sortie turnaround time which lengthened the A-10s time on station providing crucial support to Army units advancing on Bagdad and to lessen the need for tanker support.³⁵ The location of Tallil Airbase south of the Euphrates and the fact that its runway was not cratered contributed to its selection as a forward airbase.³⁶ Initially, Tallil Airbase was planned to be only a refueling location for A-10s and staging

base for combat search and rescue assets. That continued to change and eventually A-10s became based at Tallil.³⁷ The 1st Brigade Combat Team of the 3rd Infantry Division was the airfield seizure team. The airfield assessment team was embedded in an Army convoy and conducted face to face coordination with the seizure unit prior to crossing the border.³⁸ However, deploying AF security forces had no prior contact with the seizure force during the planning process for the airbase opening operation.³⁹ It is worth noting that the overall logistics status of AF units heading to Tallil was substandard. With the exception of the AF Security Forces Squadron, AF units that moved up to Tallil did not take proper amount of equipment and supplies.⁴⁰ Initial plans estimated that Tallil would be operational within two weeks from the start of airbase opening operations. Instead, the first aircraft was received four days after airbase opening operations started.⁴¹

Initial setup was quite the challenge for an airbase that had not been used by the Iraqi military since Operation Desert Storm in 1991. The 820th SFG provided Tallil its initial intelligence capability and a significant amount of the BOS. The 822nd Security Forces Squadron (SFS) after a total of only sixteen hours in Kuwait convoyed to Tallil and arrived after the assessment team which arrived in the Army convoy. The 822nd SFS convoy to Tallil is worth noting as a lessons learned. The SFS had to receive approval from seven different organizations to convoy north. It was noted that the Army units were not talking to each other and there was no single point of contact such as 3rd Army. Additionally, the SFS convoy of 29 vehicles was merged with 151 other vehicles heading to Tallil Airbase. There was no 9th AF direction on who owned the airfield which led to the issue being resolved at the local level. This wound up being a rank based resolution until both the AF and Army base leadership had the same rank. The Army infantry

battalion assigned to provide security outside of the perimeter never comprehended the surface-to-air-missile footprint which led them to stay within one mile of the base perimeter. Army dictated blackout conditions for security reasons which caused some difficulty for AF personnel not used to operating in blackout conditions.⁴² There was confusion between 3rd Army and 9th AF on who was responsible for BOS requirements at Tallil Airbase.⁴³ This combined with the lack of needed supplies and equipment brought by AF units caused a number of workarounds to be utilized by the Air Expeditionary Group Commander. This included utilizing the rescue assets to transport food, water, and other BOS items compensating for the lack of BOS from the Army.⁴⁴ This illustrates the importance of planning for all aspects of airbase opening before operations to include those common user logistics particularly at joint airbases. There was a conflict in Army orders that almost caused a gap in area security around the airbase. The assessment team leader intervened ensuring that adequate security was provided to the airbase.⁴⁵

With the security issue resolved, there were a number of other very significant issues that had to be addressed by the airbase opening team. The runway had to be cleared of buried vehicles which the Iraqi military placed every 100 feet. Since the Army started to use Tallil as an encampment additional guidance was required to keep Army tanks from parking on the runway.⁴⁶ Fuel was another key element that had to be addressed early in the airbase opening operation. Fuels Airmen rapidly placed a 50,000 gallon fuel bladder in a bermed area. The Army was the common user logistics provider for fuel which required Army trucks to deliver fuel to Tallil Airbase. Shelter, food, water,

sanitation, EOD, fire protection, and lighting all were significant issues. Food and water was provided initially utilizing the rescue assets to transport items from Kuwait.

As Tallil Airbase matured, senior leaders recognized the astounding accomplishment of opening an airbase, bedding down A-10s and conducting combat sorties. In less than a one week, the base went from a bare base to a refuel location to a beddown location producing A-10 combat sorties. Harvest Falcon packages and communications infrastructure continued to be set up, but it took almost to July for the infrastructure development to catch up with the basic requirements. The SFS continued to emphasize to the Army that security outside the perimeter needed improvement. With the lack of supporting doctrine, the infantry battalion never changed its focus. AF leadership appeared to be uncomfortable with the base cluster concept which if embraced could have enhanced base security. The role of the base cluster commander would have provided an avenue to increase the area outside the base perimeter that the SFS would maintain security in. Civil engineering focused on lodging improvements at the expense of force protection improvement.⁴⁷ Eventually, Tallil Airbase was renamed to Ali Airbase and is still in use today.

The case studies above provide a good review of airbase opening operations that have taken place in the last four years. With the information gathered above the remaining secondary questions can be answered. First, what airbase opening operations procedures were used during OEF and OIF? It is clear that a variety of airbase opening procedures were used depending on the situation. In OEF, frequently it was a pick up game with special operations forces arriving first and BOS elements arriving much later. In OIF, the use of CRG elements and concepts were applied to airbase opening

operations throughout Iraq. Even following the CRG concept of operations, there were a number of issues identified when operating at a joint airbase. The identified areas for improvements include the revamped airbase ground defense measures mentioned in the case study and doctrine sections above. Additionally, the command and control at joint bases throughout OIF was identified as an area to be improved through the utilization of the SAA and BOS-I in joint doctrine and joint airbase planning.

Second, did the US military deviate from existing doctrine regarding airbase opening operations during OEF and OIF? This can be answered both no and yes. Overall the answer is no, the military did not deviate from existing doctrine on airbase opening operations because there were no joint airbase opening operations doctrine to deviate from. Additionally, most of the related doctrine is so vague and generic when it comes to airfields that it would be difficult to identify which pieces of joint doctrine were applied. There are isolated instances based on the case study information presented above, that the military did indeed deviate from existing doctrine within the realm of engineering and rear area operations. For example, the military deviated with aircraft and operators arriving much earlier than the BOS elements. Some deviations were required by the situation using doctrine as a point of departure, some deviations were based on the lack of knowledge of leaders, and some deviations were dismissed without a good reason given.

Third, do case studies of US airbase opening operations provide pertinent lessons learned? There are a number of lessons learned from the case studies of airbase opening operations in OEF and OIF.

1. The most important lesson learned is that joint doctrine is incomplete regarding the multiple facets of airbase opening operations. The draft joint doctrine in progress now

relating to joint security operations should institutionalize some of the lessons learned for the entire joint force. This must be followed by the writing of joint doctrine for the other aspects of joint airbase operations.

2. Upfront planning of airbase opening operations must include all aspects of joint airbase operations including command and control, long term airfield usage plan, facility usage, airbase ground defense, base operating support plans, and common user logistics planning. Failure to comprehensively plan for joint airbase operations can result in conflicts in authority, facility usage, and airbase setup.

US CENTCOM put the concept of the Senior Airfield Authority (SAA) into use through their command guidance. In OEF and OIF, the SAA did not have the proper level of authority required to best execute their duties. The case studies identified instances where hangars were used for ground force tactical operations center instead of aircraft maintenance, the aircraft tower was used to house the hospital inhibiting tower operations, functions were placed within the safe distance of armed aircraft in conflict with DoD explosive safety guidelines and security of the airbase was impacted through disposition of ground forces. With the proper authority, the SAA would be able to find solutions that would not degrade airbase operations or transition to international standards. This would save money, quicken transition to host nation operations (as appropriate), increase both personnel safety and security and improve mission accomplishment.

3. Throughout OEF and OIF, challenges relating to both airfield authority and airfield operations were identified. These challenges begin in planning and continue during airbase opening operations into stability operations. During planning of joint

airbase operations, long-term planning decisions must be made regarding intentions to make or keep an airbase compliant with International Civil Aviation Organization standards and the Unified Facilities Criteria for airfield design. If these decisions are made up front the initial airbase opening operation will be more successful in the long run. There were a number of cases in OEF and OIF that resulted in increased costs for new construction due to initial airbase opening facility usage decisions. Many bases had an increased risk to personnel due to waivers to airfield or facility safety requirements. Delays in airfield readiness for international air traffic were caused by the failure of up front planning or by the lack of authority given to the SAA to fully execute the plan and ensure compliance.

4. Airbase ground defense operations must include more than inside the perimeter of the airbase. It must expand to an area of influence around the airbase that includes the footprint of a man-launched missile. This lesson learned is being incorporated into future revisions of Air Force and joint doctrine.

5. BOS must be commonly understood by all services planning to operate at a joint airbase. In both OEF and OIF, examples exist where expectations of the service did not match either the planned level of support or capabilities of the service charged with providing that support. Even though it had been established prior to operations at Tallil Airbase that BOS was to be from the Army, the AF was required to provide significant BOS resources to ensure forces were properly supported due to a difference in the level of organic support inherent in an Army unit and what is found in most AF units.

Providing BOS to a sister service is an example of CUL and the provisions of the CUL

doctrine should be addressed prior to operations. Failure to comply often results in degraded personnel support and impaired mission performance.

6. CRGs functioned extremely well in the joint airbase opening environment in OIF. However, there is no inclusion of CRGs in current joint doctrine. Changes to joint doctrine (JP 3-17) submitted by AF Doctrine Center are a step on the right path. Ultimate incorporation of this lesson will be in a new JP on joint airbase operations.

Additionally, there were lessons learned that apply to AF doctrine, concepts of operations or both. Every operation that the US military conducts will lead to some number of lessons learned. As forces collect lessons learned, the services must take those lessons learned compare them to service and joint doctrine and make changes as required.

Airbase Opening Doctrine and Its Use in OEF and OIF

Based on the answers to the secondary questions, it is easy to answer the primary research question: was the airbase opening doctrine in effect during OEF and initial OIF operations comprehensive to ensure successful future joint operations? The doctrine in place was not comprehensive enough to ensure successful joint operations. This was shown both during the doctrine analysis and case study portions of this chapter. In joint doctrine, there are a number of BOS, Airfield, or Security elements that either do not exist for airfields or the pieces of required doctrine exist across multiple JPs. This results in doctrine being incomplete with respect to airbase operations.

From the case studies, it is shown how important the idea of a BOS integrator is as well as a Senior Airfield Authority in joint airbase environments. Both of these concepts are not yet in joint doctrine. The lessons learned provide a number of items that must be included in a joint airbase operations document. The strengthening of the SAA

will ensure that future operations are conducted optimizing both the airbase opening and the use of the airbase in long term stability operations.

The inclusion of lessons learned into joint doctrine on airbase opening will ensure that future joint operations establish airbase operations quickly, maximize use of existing facilities, prepare for long term use of the airbase and maximize the security and safety of assigned personnel. The result will be a truly successful airbase opening as defined earlier. Even with the absence of sufficient doctrine, Soldiers, Sailors, Marines and Airmen will make it happen. To ensure successful future joint operations, improvements to doctrine need to be made based on the lessons learned in OEF and OIF.

¹Col John Dobbins, "Airpower 101: An Expeditionary Air Base Model," *Aerospace Power Journal*, 18, no. 3 (2004): 54-65.

²Headquarters, Department of the Army, FM 3-0, *Operations* (Washington, DC: Government Printing Office, August 2003), 4-15.

³*Ibid.*

⁴*Ibid.*, 4-16.

⁵*Ibid.*, 4-18.

⁶Headquarters, Department of the Air Force, AFDD 2-4, *Combat Support* (Washington, DC: Government Printing Office, November 2003), 2.

⁷Chairman of the Joint Chiefs of Staff, JP 3-10, *Joint Doctrine for Rear Area Operations* (Washington, DC: Government Printing Office, May 1996), II-12.

⁸Chairman of the Joint Chiefs of Staff, JP 1-06, *Joint Tactics, Techniques and Procedures for Financial Management* (Washington, DC: Government Printing Office, December 1999), G-12.

⁹Chairman of the Joint Chiefs of Staff, JP 5-00.2, *Joint Task Force Planning Guidance and Procedures* (Washington, DC: Government Printing Office, 1999), VIII-8.

¹⁰*Ibid.*, VIII-15.

¹¹Chairman of the Joint Chiefs of Staff, JP 4-01.5, *Joint Tactics, Techniques and Procedures for Financial Management* (Washington, DC: Government Printing Office, April 2002), A-G-1.

¹²Chairman of the Joint Chiefs of Staff, JP 4-02, *Doctrine for Health Service Support in Joint Operations* (Washington, DC: Government Printing Office, 2001), II-1.

¹³Chairman of the Joint Chiefs of Staff, JP 4-04, *Joint Doctrine for Civil Engineering Support* (Washington, DC: Government Printing Office, 2001), IV-3.

¹⁴Chairman of the Joint Chiefs of Staff, JP 3-10, II-12.

¹⁵Chairman of the Joint Chiefs of Staff, JP 4-07, *Joint Tactics, Techniques, and Procedures for Common-User Logistics During Joint Operations* (Washington, DC: Government Printing Office, June 2001), X.

¹⁶Headquarters, Department of the Air Force, AFDD 2-4, 5.

¹⁷Chairman of the Joint Chiefs of Staff, JP 4-01.5, II-23.

¹⁸Chairman of the Joint Chiefs of Staff, JP 4-04, I-3.

¹⁹Chairman of the Joint Chiefs of Staff, JP 3-30, *Command and Control for Joint Air Operations* (Washington, DC: Government Printing Office, June 2003), A-4.

²⁰Chairman of the Joint Chiefs of Staff, JP 4-04, IV-7.

²¹Chairman of the Joint Chiefs of Staff, JP 4-01.5, II-11.

²²Chairman of the Joint Chiefs of Staff, JP 3-10, II-11.

²³Headquarters, Department of the Air Force, AFDD 2-4.1, *Force Protection* (Washington, DC: Government Printing Office, November 2004), 29.

²⁴*Ibid.*, 31.

²⁵Chairman of the Joint Chiefs of Staff, JP 6-0, *Joint Communications System* (Washington, DC: Government Printing Office, March 2006), II-1.

²⁶*Ibid.*, II-16.

²⁷Headquarters, Department of the Air Force, AFDD 2-4.4, *Bases, Infrastructure, and Facilities* (Washington, DC: Government Printing Office, November 1999) 14.

²⁸Thomas Preston to James Long, Airbase Opening Procedures, personal electronic mail, April 2006.

²⁹Tom Sawyer, *High-tech Tools and Hard, Hard Work at FOB Rhino* [document on-line]; available from <http://www.construction.com/NewsCenter/Headlines/ENR/20020225.asp>; Internet; accessed 20 March 2006.

³⁰Jay M. Holtermann, "The 15th Marine Expeditionary Unit's Seizure of Camp Rhino," *Marine Corps Gazette* 86, no. 6 (June 2002): 41-44.

³¹Forrest L. Marion, *Building USAF 'Expeditionary Bases' for Operation Enduring Freedom-Afghanistan, 2001-2002* [document on-line]; available from <http://www.airpower.maxwell.af.mil/airchronicles/cc/archives.html>; Internet; accessed 12 February 2006.

³²*Ibid.*

³³*Ibid.*

³⁴Robert S. Tripp, et al., *Supporting Air and Space Expeditionary Forces: Lessons from Operation Enduring Freedom* (Arlington VA: RAND, 2004), 37.

³⁵Adam J. Herbert, "Adventures in Bare Bones Basing," *Air Force Magazine* 86, no. 10 (October 2003): 77.

³⁶Dobbins, 54-65.

³⁷Scott Farrar to James Long, Airbase Opening Procedures, personal electronic mail, April 2006.

³⁸Contingency Response Wing (CRW) Mission Brief, ver. 16 (McGuire Air Force Base: CRW, 2006) 12.

³⁹Kevin Cullen to James Long, Airbase Opening Procedures, personal electronic mail, April 2006.

⁴⁰Farrar.

⁴¹Herbert, 77.

⁴²Farrar.

⁴³Cullen.

⁴⁴Dobbins, 54-65.

⁴⁵Contingency Response Wing Mission Brief, 22.

⁴⁶Herbert, 77.

⁴⁷Farrar.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after the changes occur.

Guilio Douhet

Air superiority is not the God-given right of Americans. It doesn't just happen. It takes a lot of people working hard to produce the capabilities that provide it for US forces.

Gen Ronald R. Fogleman, USAF

Introduction

The two above quotations sum up the entire purpose and results of this thesis. First, the Douhet quote stresses the importance to anticipate when an organization needs to make preemptive changes before being forced to by world events. This is exactly the path that the USAF took in the mid-1990s. Gen John Jumper as the commander of US Air Forces in Europe anticipated the emphasis of an expeditionary AF. He created the first Contingency Response Group (CRG) to provide rapid reaction, worldwide airpower. That foresight was proven to be accurate in Operation Allied Force but was more vital in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). Without the establishment of CRGs airbase opening operations in OEF and OIF would have been almost impossible.

The quote by General Fogleman is emphatic that airpower operations are complex and the result of hard work. This concept applies directly to the ability to conduct airbase opening operations. As described in the case study section, there was nothing easy about

the accomplishments of those who opened airbases in OEF and OIF. It is through the blood, sweat, and tears of great Americans that Agile Combat Support becomes a reality.

Airbase operations are complex and vital to successful air campaigns as well as the overall operation. With recent experience in OEF and OIF, now is the perfect time to evaluate whether airbase operations doctrine is sufficient to ensure successful future joint operations. This thesis is key during the Global War on Terrorism (GWOT) as military has operations across the world on airfields in operational environments that range from permissive to unknown to hostile. The purpose of this thesis was to improve airbase opening operations which, in turn, would improve the ability of the US Air Force to rapidly and efficiently provide airpower to Joint Forces Commanders worldwide. Prior to this thesis, the topic of doctrine and airbase opening had not been studied in depth. The lack of research contributed to its selection as a fiscal year 2006 priority one topic of the Air Force Institute of National Security Studies. This thesis provides ample data and analysis for the AF and joint doctrine community to answer the initial question posed by the AF Institute of National Security Studies.

The analysis chapter of the thesis researched all joint doctrine for the components of airbase opening operations. This research was summarized in table 2 which detailed each JP and whether the publication contained guidance on areas that make up the components of airbase opening operations in a joint environment. These components included base operating support (BOS), security, airfield, and communications. This research identified that there is no single joint doctrine document which provides guidance for airbase opening operations. There are a number of JPs that provide guidance on elements that go into airbase operations but frequently the guidance was not intended

for airbase operations. If it does apply to airfields the focus is on the air mobility terminal operations.

The remaining secondary research questions required a look at the military's experiences in OEF and OIF. The case studies coalesced the available information on the different airbase opening operations from single service operations in Liberia and Afghanistan to joint airbase opening operations in both OEF and OIF. Through the research it was determined that there was a lack of applicable doctrine. However, there were times when existing doctrine was not followed. The author showed that the airbase opening operation procedures were rooted in the CRG concept of operations. OEF was a little ad hoc due to its quick execution but the experiences from OEF refined the CRG concept of operations. A number of lessons learned were gathered based on the large number of airbase opening operations in OEF and OIF.

This leads back to the primary research question: Was doctrine in place during OEF and initial OIF operations regarding airbase opening operations comprehensive to ensure successful future joint operations? The research gathered shows that indeed the doctrine in effect was not comprehensive to ensure successful joint airbase operations. That does not mean that airbase opening operations were ineffective. The information gathered shows that they were indeed successful but that the success was accomplished without comprehensive doctrine.

Interpretation of Findings

The research demonstrates that contingency response group development was key to AF readiness for OEF and OIF. The lessons learned from OEF and OIF provide direction for further refinement of the CRG concept of operations and more importantly

its incorporation into AF and joint doctrine. The results showed that there is a plethora of joint doctrine available and that it covers many of the areas required for airbase opening operations. However, the lack of a joint airbase publication demonstrates that the Cold War mindset, of forward based single service airbases, is slow to melt away even in today's contemporary operating environment.

The results both in the area of doctrine and US experiences in OEF and OIF regarding command relationships indicate that improvement is needed. Absent in doctrine is any discussion of a joint airbase commander or SAA and their relationship with the area or base commander. The lack of guidance if not corrected will cause each combatant commander to have a different solution. This most likely would cause problems as forces deploy from theater to theater.

It was unexpected to find out that units deploying to Tallil were woefully equipped. Each commander must ensure that his unit and Airmen have all the required equipment and supplies to operate in any environment from a bare base to a civilian airport. Based on US experiences in OEF, it should have been no surprise that the military would open seven airbases in Iraq that would need to be adequately manned.

BOS is vital to airbase opening operations as the case studies showed in both OEF and OIF. BOS deficiencies can result in health problems, or worse, mission impairment. It is important that BOS and SAA responsibilities get into joint doctrine to prevent repeat issues during future operations. The required changes in airbase ground defense are in the draft JP. The concept of AF security forces performing duties outside the perimeter is a new concept for most of the AF security forces. Accordingly, training must change,

equipment may need to change, and other Airmen (maintenance, finance, etc) must be properly trained on their responsibilities in airbase ground defense.

Recommendations

1. The thesis identified a number of issues that are worthy of future study and research.

2. What role should the Air Operations Center have in Airbase Opening?

3. In expeditionary operations, what intelligence support is required by BOS and security elements in addition to support needed for aircraft operations?

4. Should the AF airbase opening organization, the CRG, be aligned and collocated with Army units like Tactical Air Control Party and Weather?

5. Is the DoD fully utilizing the guidance and capability that common user logistics provides? This is especially valuable at joint airbases. Many readings during the review of literature recall when the US military was expeditionary throughout the world in World War II and engineering capability was combined under a single commander. The military has returned to this expeditionary force structure with bases scattered throughout the world. Should the engineering capabilities of the joint community be compiled into a joint command or into a task force within a theater?

6. What is the optimal scope, depth, and frequency of training relating to airbase opening operations? Who needs what portions of the training? What training do units outside the CRG community need?

7. There is little information available that studies the US - multinational airbase operations. What stays the same and what changes?

In addition to future research considerations, there are actions that must be taken to change the answer of the primary research question to a yes and improve operations.

1. Create a single joint doctrine addressing all aspects of airbase operations
2. Publish updates to AFDD 2-4.4 and JP 3-10 as soon as possible. The drafts are on target but until they are published they are of little help.
3. Initiate joint airbase opening operation exercises in multiple theaters. US Central Command is experienced but what about opening a joint base in Indonesia or Darfur? Would Pacific or European Command be as proficient?
4. Develop intelligence support requirements for airbase opening operations.
5. Expand the knowledge of AF personnel regarding common user logistics. How does the AF leverage it in joint airbase operation planning and execution?

Conclusions

The primary and secondary research questions were answered by the thesis. This document provides the AF Institute of National Security Studies the information requested as a priority one topic. By the end of 2003, the attention on joint airbase opening operations peaked. The impetus was from the Air Force Chief of Staff down to the Airmen assigned to bases worldwide. Much was written from the middle of 2003 to the end of 2004. It is important that the doctrine community get the draft publications at both the AF and joint level approved and released. Current deployed wing and group commanders still identify in their after-action reports the importance of command and support relationships at a joint airbase. Their release would provide a ninety percent solution for current airbase opening operation procedures. Until the publications are released, joint airbase operations will still be an ad hoc event benefiting few. OEF was a

come as you are event that relied on the flexibility and ingenuity of Soldiers, Sailors, Airmen, and Marines. OIF, in contrast, was a deliberate planning event that built upon US experiences in OEF. The importance of joint doctrine is exemplified when operating with a sister service or multinational partner. Joint airbase operations are vital to success as the United States continues to fight the GWOT worldwide in every environment imaginable.

APPENDIX A

AIRBASE OPENING OPERATIONS DOCTRINE REVIEW WORKSHEET

Publication:

Publication Date:

Overview of Publication:

Overview of Airbase Opening Operations topics addressed within the publication:

(BOS-I) Contracting:

Messing/Water:

Sanitation/laundry/bath:

Environmental:

Field engineering:

Materials handling equipment:

Explosive ordinance disposal:

Medical:

Nuclear biological, and chemical protection

Industrial, storage & road/rail:

Utilities:

Lodging:

Base security: (gate security, internal security, perimeter security)

(SAA) Refueling:

Crash/fire/rescue:

Air traffic control:

Weather:

Lighting:

Fleet service:

Materials handling equipment

Communications integrator:

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