The Air Force's True Expeditionary Roots: Historical Context and Lessons for the Agile Combat Employment (ACE) Concept

A Monograph

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Seventy-seven years previous, the Ninth Air Force in World War II operated similarly to the ACE concept when they built, rehabilitated, supplied, and operated on 241 airfields across the European continent. This monograph seeks to demonstrate that the Ninth Air Force's expeditionary experiences during World War II in the ETO offer important historical context and many lessons that the Air Force could learn from as they develop and implement the ACE concept.

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

Abstract

The Air Force's True Expeditionary Roots: Historical Context and Lessons for the Agile Combat Employment (ACE) Concept, by Maj Justin R. Davis, 82 pages.

In the two decades that the United States has been at war against terrorism, the operational environment has changed. China and Russia have modernized their conventional militaries with long-range precision weapons that place the United States' large airbases—once considered sanctuary—at risk. Thus, the Air Force is developing the Agile Combat Employment (ACE) concept to move away from the large airbase model and move towards a model where variable-sized air forces operate from multiple small, dispersed airfields across the theater to complicate enemy targeting and increase survivability.

Seventy-seven years previous, the Ninth Air Force in World War II operated similarly to the ACE concept when they built, rehabilitated, supplied, and operated on 241 airfields across the European continent. This monograph seeks to demonstrate that the Ninth Air Force's expeditionary experiences during World War II in the ETO offer important historical context and many lessons that the Air Force could learn from as they develop and implement the ACE concept.

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I would also like to thank Mr. David Little, who pointed me in the right direction for critical sources that tell the IX Engineer Command's miraculous story. His website was the first breadcrumb I picked up on an extended research trail that resulted in this monograph. His grandfather—Colonel Pat Little, commander of the 922nd Aviation Engineer Regiment—was one of the unsung heroes this monograph is about and whose lessons should not be forgotten. Not only because their story is awe-inspiring, but because the lessons they accumulated were paid for in blood. The current generation should take advantage of those lessons.

Additionally, I would like to thank the archivists at the Air Force Historical Research Agency (AFHRA). Their help in providing digitized microfilm reels enabled me to use primary sources rather than regurgitating secondary sources. I am very grateful for their timely support.

Finally, I would be remiss not to thank my family and, in particular, my wife, Megan. She is a wife, a mother of four, and a Lieutenant Colonel in the Air Force that is also attending the School of Advanced Military Studies. She finished her monograph four months before I did so she could periodically edit my draft chapters and be a sounding board for my ideas. She is amazing, and I cannot thank her enough.

Abbreviations

ACC	Air Combat Command
ACE	Agile Combat Employment
ADG	Air Depot Group
AEAF	Allied Expeditionary Air Force
AFSC	Air Force Service Command
ALG	Advanced Landing Ground
AOC	Air Operations Center
APL	Anti-Personnel Landmines
BCD	Battlefield Coordination Detachment
BLOS	Beyond Line of Sight
BOS-I	Base Operating Support-Integrator
C2	Command and Control
CBO	Combined Bomber Offensive
CCS	Combined Chiefs of Staff
COMZ	Communications Zone
COSSAC	Chief of Staff to the Supreme Allied Commander
EAB	Engineer Aviation Brigade
EAR	Engineer Aviation Regiment
ELS	Emergency Landing Strip
ETO	European Theater of Operations
FARP	Forward Arming and Refueling Point
FG	Fighter Group
GLD	Ground Liaison Detachment
LOS	Line of Sight
MAJCOM	Major Command

MCA	Multi-Capable Airman
OE	Operational Environment
PACAF	Pacific Air Forces
PHS	Pre-fabricated Hessian Surfacing
POL	Petroleum, Oil, and Lubricants
PSP	Pierced Steel Plank
R&R	Refueling and Rearming
SMT	Square Mesh Track
TAC	Tactical Air Command
TAD	Tactical Air Depot
TRG	Tactical Reconnaisance Group
USAFE	United States Air Force in Europe

Figures

Prologue

On the morning of December 18th, 1944, the weather was forecast to be 10/10 over Northern France, Luxembourg, and Belgium. In the 365th Fighter Group (FG), a group of airmen stared at the fog through a window. A depressed sergeant said, "on a day like this, even the birds walk."[1] The group commander, Colonel Ray J. Stecker, feared that due to the weather, none of his flights would be effective on a day in which the Allies would need them most. Two days prior, at 0530 on the 16th, Adolf Hitler launched the Wehrmacht's final assault, the Ardennes counter-offensive, or, known by its more popular name, the "Battle of the Bulge." The Wehrmacht's strategic target was Antwerp's port on the Belgian coast, which would deliver a blow to the Allies sustainment capability and split the Allied army in two.[2] By the morning of the 18th, *Kampfgruppe Peiper* had advanced through the Losheim Gap, past Honsfeld, Büllingen, Stavelot, and into Trois Ponts, encountering only minimal resistance.[3]

A mere 20 miles away, General Elwood "Pete" Quesada—commander of IX Tactical Air Command (TAC), headquartered at Verviers, Belgium—telephoned the 67th Tactical Reconnaissance Group (TRG) commander, Colonel George W. Peck. General Quesada implored Colonel Peck to find a few volunteers willing to fly their F-6 Mustangs through the debilitating weather to locate the German armored spearhead. Colonel Peck found volunteers in Captain Richard Cassady and Lieutenant Abraham Jaffe, who General Quesada personally briefed over the telephone.[4]

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[1] The Ninth Air Force, *Invasion Air Force: The Ninth Joins the Spearhead of European Assault 1942-1945*, 1945, 385, Reel B5636, Air Force Historical Research Agency (AFHRA).

[2] Charles Brown MacDonald, *A Time for Trumpets: The Untold Story of the Battle of the Bulge*, 1st ed. (New York: Morrow, 1984), 23.

[3] Ibid., 197–199; *Kampfgruppe Peiper* was a German combined arms formation, equivalent in size to one and a half American tank battalions. As per German convention, the Kampfgruppe was named after their commander, Joachim Peiper. The 1st SS Panzer Corps commander, General Priess, gave Peiper "the decisive role in the offensive," which was to drive swiftly to the River Meuse.

[4] An F-6 Mustang is a P-51 Mustang modified for tactical reconnaissance.

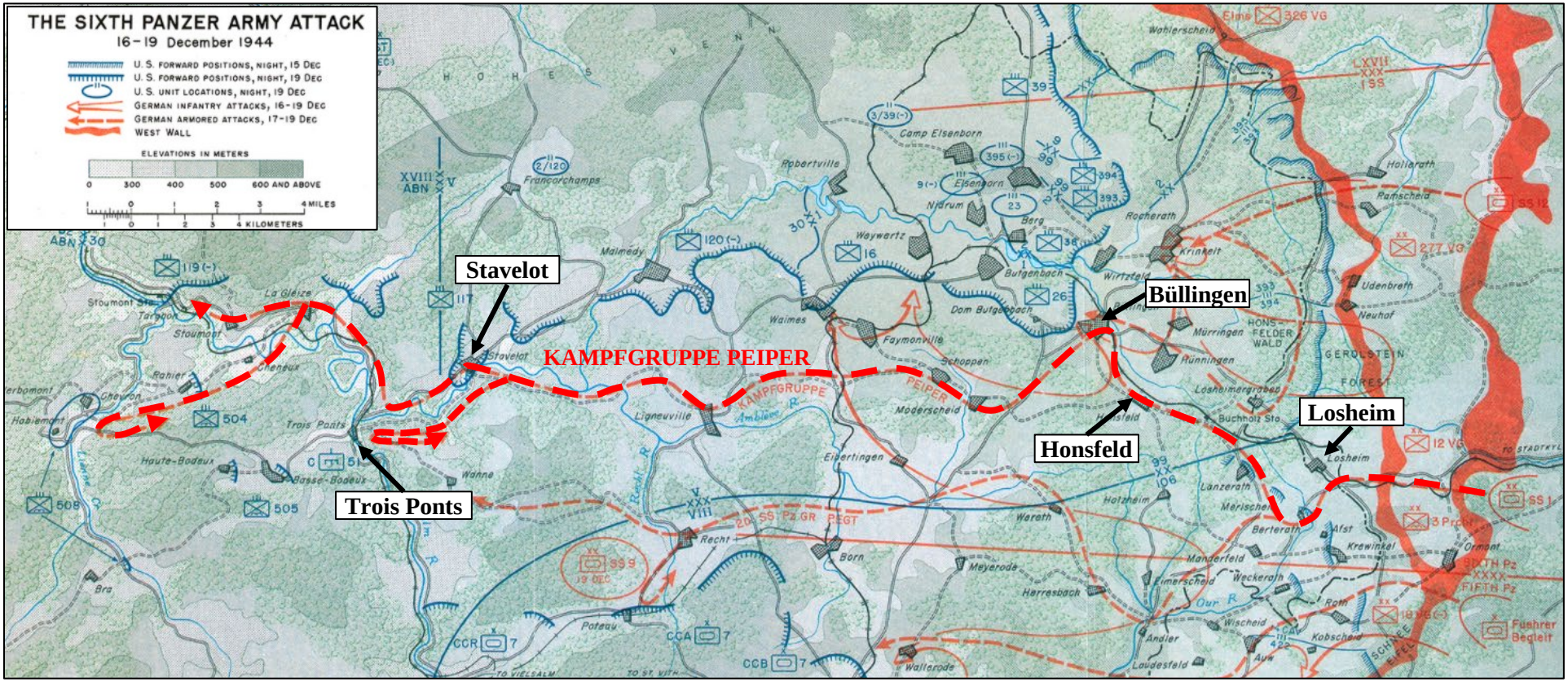

Figure 1. The Sixth Panzer Army Attack: 16 – 19 December 1944

Source: Hugh M. Cole, *The Ardennes: Battle of the Bulge*, United States Army in World War II: The European Theater of Operations (Washington, DC: Center of Military History, 1965), map 2.

The two pilots flew up the Amblève River valley towards Stavelot, Belgium. As Lieutenant Jaffe recalled, "It was so foggy we had to fly in the valleys, sometimes at less than a hundred feet, in order to miss the hills and still be able to see the ground."[5] Thankfully, General Quesada and Colonel Peck's gamble paid off when Cassady and Jaffe found sixty Nazi tanks and other armored vehicles near Stavelot. The Germans were so surprised that the two pilots were able to make two passes on them before they fired on the Mustangs during the third pass. "We could see the German's faces as they fired rifles at us. There were machine guns, 20 mm flak and pistols, too, -- everything they had," recalled Cassady.[6] Following their pass, the pilots radioed their findings to IX TAC headquarters, where Colonel Gilbert L. Meyers, General Quesada's operations chief, organized the fighter-bomber response.

Colonel Meyers initially called upon Colonel Stecker of the 365th FG and said, "a Jerry column has broken through our lines at Stavelot. In fact, there is nothing between it and the English Channel but service troops and cooks and bakers." Colonel Stecker initially rebuffed the mission based on the grounding weather. "I know," pleaded Colonel Meyers, "the weather is down on the deck and it probably will be suicide but Goddamn it, the Army says we've got to get something in there or the bastards will be in Liège." "See what we can do," replied Colonel Stecker.[7] As he put down the phone, Colonel Stecker summoned the fighter squadron on standby and briefed his plan. He said, "Men, this is going to be rough but the krauts have just given us a hell of a kick in the pants at the front."[8] Colonel Stecker finished the briefing, and the pilots went to their aircraft.

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[5] 67th Tactical Reconnaissance Group, "Headquarters, 67th Tactical Reconnaissance Group History Installment for December, 1944," January 14, 1945, 2, Reel B0773, Air Force Historical Research Agency (AFHRA).

[6] Ibid., 3.

[7] The Ninth Air Force, *Invasion Air Force*, 385–386.

[8] Ibid., 385.

Major George R. Brooking led the first flight of the 365th Fighter Group "Hell Hawks" in their P-47 Thunderbolts towards Stavelot. Once over the area and seeing only a blanket of clouds below him, Major Brooking sent the flight that took off twenty minutes behind him back to base. However, Major Brooking's flight of four Thunderbolts stayed. Something gave him an idea to take the most considerable personal risk of his flying career. Perhaps because he had flown around the area's 2,000-foot Belgian mountains the day prior, or because he realized the importance of stopping the armored thrust towards Liège, or both. Whatever the reason, Major Brooking declared to his wingmen, "I'm going down to poke around by myself. There must be a break somewhere in those mountains." His wingmen replied, "You're crazy."[9]

Despite his wingmen's admonishment, Major Brooking let his Thunderbolt down through a narrow opening in the clouds, which nearly collapsed on him while dodging ridgelines on the way down. As the valley floor came into view a mere hundred feet above the trees, he scoured the roads and the tree lines for German armor. The roads were empty. He decided to press his luck, climb back through the clouds, and try again. He knew there was another valley to the west since the ridgelines ran parallel to each other; however, this time, there was no hole in the clouds that he could thread his Thunderbolt through. Despite this fact, Major Brooking gently let his Thunderbolt down through the clouds, expecting at any moment to feel the impact of the mountains below him. Rather than meet his maker, Major Brooking met the main body of *Kampfgruppe Peiper*, twenty feet below him. The surprise was mutual; neither fired a single shot.[10]

Major Brooking talked his flight down through the weather, and the four Thunderbolts began their "turkey shoot." From treetop level, Major Brooking's flight of Thunderbolts each dropped their two 500lb general purpose bombs fused with an 8-15 second delay and strafed

[9] The Ninth Air Force, *Invasion Air Force*, 386.

[10] Ibid.

targets with their eight Browning M2 .50 caliber machine guns. After inflicting heavy damage and dodging considerable flak during their initial onslaught, Major Brooking and his wingmen zoomed their Thunderbolts up through the clouds and radioed their luck to IX TAC headquarters.[11]

Radar controllers dispatched several flights of Thunderbolts from Northern France and Belgium towards Stavelot. Even though one of his wingmen had to perform a belly landing and his other two wingmen had to return to base due to battle damage, Major Brooking stayed. For the rest of the day, Major Brooking "directed traffic" for several Thunderbolts, including a flight of sixteen P-47s—led by the 365th FG commander, Colonel Stecker—and fourteen P-47s from the 368th FG, among others.[12] In all, the Mustangs and Thunderbolts that greeted *Kampfgruppe Peiper* on the 18th damaged or destroyed thirty-two armored and fifty-six motor vehicles in the Belgian valleys near Stavelot.[13]

While some authors have noted the tendency to exaggerate ground claims, particularly in this battle, the fact that the fighter-bombers halted the armored thrust for approximately two hours, which meant that *Kampfgruppe Peiper* failed in their objective, is indisputable.[14] A IX TAC report summed up the impact by saying that the attack "was so savage and the destruction it caused was so great that the northern most Nazi armored column was forced to turn south instead of continuing toward its objective, the important supply and communications center of Liège."[15]

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[11] The Ninth Air Force, *Invasion Air Force*, 386.

[12] Ibid.; 368th Fighter Group, "Headquarters, 368th Fighter Group History Installment for December 1944," January 17, 1945, 9, Reel B0335, Air Force Historical Research Agency (AFHRA); 365th Fighter Group, "Headquarters, 365th Fighter Group History Installment for December 1944," January 10, 1945, 2, Reel B0328, Air Force Historical Research Agency (AFHRA).

[13] Wesley Frank Craven and James Lea Cate, eds., *Europe: Argument to V-E Day, January 1944 to May 1945*, The Army Air Forces in World War II (Washington, D.C.: Office of Air Force History, 1983), 688.

[14] MacDonald, A Time for Trumpets, 242.

[15] 365th Fighter Group, "365th FG History, December 1944," 2.

It is important to note—especially for this monograph—that before D-Day, the 67th TRG, the 365th FG, and the 368th FG operated from bases in southern England, approximately 330 miles, or a little over an hour flight from Stavelot, Belgium. On December 18th, 1944, the 67th TRG launched from A-87 near Gosselies, Belgium, a mere 65 miles away and 14-minute flight.[16] The two fighter groups launched their sorties from A-84 near Chievres, Belgium, 93 miles away, or an 18-minute flight. Additionally, on the afternoon of December 18th, the "overcast in the target area broke for less than an hour."[17] So, if these three groups were still operating from southern England, by the time Colonel Peck received the desperate phone call from General Quesada and the F-6s flew to Stavelot, the hole in the clouds would have vanished. Thus, Captain Cassady, Lieutenant Jaffe, Major Brooking, and others would not have found, delayed, or stopped *Kampfgruppe Peiper* on December 18th. Considering that Allied tactical airpower would not have another view of the ground until the weather cleared on December 23rd, one can make his own counterfactual conclusion on Liège or Antwerp's fate and the outcome of the Battle of the Bulge.

[16] 67th Tactical Reconnaissance Group, "67th TRG History, December, 1944,".

[17] 368th Fighter Group, "368th FG History, December 1944," 2; 365th Fighter Group, "365th FG History, December 1944," 2.

Chapter One

Introduction

The prologue depicts a historic air-to-ground battle that had strategic significance and displayed the heroic actions of the Allied tactical aviators of IX TAC. In reading such a story, one's thoughts naturally turn to General Quesada's command decisions, where he willingly risked his pilots' lives for a tactical and arguably strategic objective. Or one's thoughts might turn to the heroic actions of Captain Cassady, Lieutenant Jaffe, Major Brooking, or any of the other pilots who volunteered for such a mission. A mission that required them to descend through the weather into unknown terrain, skillfully fly their aircraft between the Ardennes trees and the low hanging clouds at "treetop level," all while dodging the German flak at near-point blank range.

Yet, this monograph is not a story about the Battle of the Bulge or the heroic actions of the nation's finest tactical aviators. Instead, it is a story not often told, a story of the engineers, airdrome support personnel, and fighter group leadership that enabled such heroic actions. During World War II, these unsung heroes built, rehabilitated, supplied, and operated on 241 airfields in the European Theater of Operations (ETO) between D-Day and V-E Day.[18] They did this for multiple reasons, one of which—decrease the enroute time to the front lines—is demonstrated by the prologue's historical accounts. Other reasons include reducing the length of supply lines, sortie duration, and distance to the front lines. Still more reasons include airfields serving as emergency landing strips (ELS), casualty evacuation points, or rearming and refueling (R&R) strips.

Seventy-seven years later, the US Air Force is developing the Agile Combat Employment (ACE) concept to help solve the challenges imposed by the rapidly developing and adapting operational environment (OE) of 2021. Since the opening days of Operation Enduring Freedom,

[18] Lloyd F. Latendresse 1st Lt. et al., *The History of IX Engineer Command: From Its Beginning to V-E Day*, Information Control Command Printing Plant. (Wiesbaden, Germany, 1945), 146.

the joint air operations team has operated from expeditionary air bases varying in size from a relatively small forward operating base to a complete airbase housing multiple air expeditionary wings, an air operations center, and numerous coalition and joint units. Despite frequent indirect fire attacks—which nearly every tactical aviator (including the author) has endured since 2001—survivability at these airbases has not been credibly and consistently challenged. With the pivot in priority away from terrorism and towards "inter-state strategic competition," the United States has reexamined the capabilities that the modern Chinese and Russian militaries have developed and has judged the United States' large airbase model vulnerable.[19] Thus, the ACE concept moves away from large airbases representing a critical vulnerability and moves towards a model where variable-sized echelons operate from multiple small, dispersed airfields across the theater to complicate enemy targeting and increase survivability.

While the main reasons the Allies built and operated on advanced landing grounds (ALG) during World War II might differ from the reasons the Air Force is moving towards the ACE concept seventy-seven years later, there are many similarities in the two concepts. As Mark Twain is known for saying, "history doesn't repeat itself, but it certainly rhymes." Thus, this monograph will demonstrate that *the experiences the Ninth Air Force accumulated as they built, rehabilitated, supplied, and operated on 241 airfields across the European continent offer important historical context and many lessons that the Air Force could learn from as they develop and implement the ACE concept.*

Methodology

This study uses a historical case study analysis of how the Ninth Air Force built, rehabilitated, supplied, and operated on 241 airfields in the ETO during World War II. The

[19] Jim Mattis, *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge* (Washington, D.C.: U.S. Department of Defense, January 19, 2018), 1, accessed April 26, 2020, https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf.

purpose of this study is twofold. This study's primary purpose is to provide historical context for staff officers planning and conducting future ACE operations. For such officers, this monograph can serve as a single-source reference to answer the natural question: how did we do it in World War II? This study's secondary purpose is to provide historical, relevant lessons for officers to consider when planning ACE operations.

This study was organized around one primary research question: What relevant lessons from the Ninth Air Force's intra-theater fighter group deployments during World War II in the ETO should the Air Force consider when planning for the Agile Combat Employment concept? To answer this primary research question, the author answered two secondary questions. First, how did the Allies build, rehabilitate, supply, and operate on the Advanced Landing Grounds? Second, what common challenges did the Ninth Air Force units face, and how did they solve them?[20]

To scope the research while still fulfilling the studies' two purposes, the author made several delimitations. First, history is replete with airpower examples either using or planning to use several small airfields to operate from in time of war. Examples include World War II, the Korean War, the Vietnam War, planning during the Cold War, and Operation Desert Storm, to name a few. This study will only look at World War II. Second, while ALG operations occurred in nearly every theater in World War II—particularly in the European and Pacific theaters—this study will only examine operations in the European Theater. Finally, while the Allies built, rehabilitated, supplied, and operated from ALGs throughout the entire war, this study will only

[20] In his research, the author encountered two main limitations that marginally hindered the study. First, due to COVID-19, the author could not travel to any archives that hold the primary sources most applicable to this study. Fortunately, the Air Force Historical Research Agency at Maxwell Air Force Base, Alabama, has already digitized many World War II microfilm reels, including the reels most applicable to this study.

A second limitation on the effectiveness of this study is that of classification. While the challenges associated with the ACE concept are mostly unclassified, any ongoing work to mitigate or solve these challenges is taking place on classified systems. Thus, while this monograph offers several recommendations for the Air Force to consider, some of these recommendations may already be accounted for in classified plans.

focus on those ALGs built, supplied, and operated on between D-Day on June 6th, 1944, and V-E Day on May 8th, 1945.

Chapter Conclusion

"The results achieved in Europe will not give the answer to future problems; they should be treated rather as signposts pointing the direction in which such answers may be found."[21] This quote is part of the US Strategic Bombing Survey from World War II, although the same could be said about tactical airpower in the ETO. While the ACE concept will certainly not repeat how the Allies used ALG's in Europe, this monograph will show that the Ninth Air Force in the ETO is a signpost pointing towards ACE and that the two concepts indeed rhyme. Thus, if a single air planner better understands the historical context for ACE or, better still, considers and applies the lessons from this study, the purpose of this monograph will be fulfilled.

[21] US Department of War. *The United States Strategic Bombing Survey: Summary Report (European War).* (Maxwell AFB: Air University Press, 1987), 41.

Chapter Two

Agile Combat Employment

> Agile Combat Employment is a key operating concept for how the USAF will fight in a modern, contested environment. This environment might not be where we want to fight—but it will likely be where we have to fight.
>
> —General Charles Q. Brown, Jr., *Agile Combat Employment (ACE) PACAF Annex to Department of the Air Force Adaptive Operations in Contested Environments*

Introduction

The Air Force of 2021, as part of the United States' military instrument of national power, is in a state of inter-state competition with several strategic competitors—namely China and Russia.[22] These competitor nations have rapidly developed advanced military technology to challenge the United States' dominance in every warfighting domain by targeting the critical vulnerabilities in the United States' operating concepts. One such perceived vulnerability is the Air Force's large airbase model. These airbases—traditionally regarded as a sanctuary for the United States and coalition forces—now represent large, static targets within the range of most modern adversary weaponry. In response, the US Air Force is developing and experimenting with the Agile Combat Employment (ACE) concept, which outlines "how the USAF and its allies will fight in a modern, contested environment."[23]

The purpose of this monograph is not to assess ACE. This concept is changing every day, so any analysis would be premature. Instead, this monograph seeks to add to the discussion by providing historical context and by offering historical lessons for ACE planners to consider.

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[22] Mattis, *2018 National Defense Strategy*, 4.

[23] United States Pacific Air Forces, "Agile Combat Employment (ACE): PACAF Annex to Department of Air Force Adaptive Operations in Contested Environments" (United States Pacific Air Forces, June 2020), 14.

However, the reader requires a certain base-level understanding of ACE to have the necessary context for chapter four's lessons and recommendations.

What is Agile Combat Employment?

Within the past decade, various echelons in the Air Force have been developing and experimenting with modern concepts to present, sustain, protect, and command and control (C2) air forces operating in increasingly contested operational environments. Throughout this time, parallel, supporting, and sometimes competing concepts have emerged; however, in the Air Force's lexicon of 2021, ACE has emerged as the en vogue concept throughout the Air Force.[24]

The current definition for ACE is "a proactive and reactive operational scheme of maneuver executed within threat timelines to increase survivability while generating combat power."[25] The concept envisions tactical air forces operating from several dispersed small airfields to increase survivability and present adversaries with operational unpredictability. These tactical forces are given the necessary sustainment, protection, and command and control to "create a potent US capability that both assures allies and partners and deters aggression abroad."[26] Many ideas and subordinate concepts support the ACE concept. The two most pertinent to this monograph are various basing approaches and the Multi-Capable Airmen (MCA) concept.[27]

Basing Approaches

Major Commands (MAJCOM) and wings across the Air Force have experimented with and developed several different basing approaches. The most prevalent of which are discussed at length in a RAND study commissioned by the Air Force and sponsored by the Air Force Deputy

[24] Concepts such as Adaptive Basing, Agile Combat Employment, Agile Combat Support, Dynamic Force Employment, Flex-Basing, Rapid Raptor, Cluster Basing, Dynamic Forward Adaptive Basing, Untethered Operations, and Adaptive Operations in Contested Environments.

[25] United States Pacific Air Forces, "PACAF ACE Annex," 2.

[26] Ibid.

[27] Ibid., 9, 11.

Chief of Staff for Logistics, Engineering and Force Protection (A4). The RAND study splits basing approaches into two categories: complementary capability and equal capability locations.[28]

Complementary capability locations are bases that have varying levels of sustainment capabilities. For example, aircraft would receive one type of service (e.g., fuel) at location-X and a different kind of service (e.g., ammunition) at location-Y. Basing approaches for complementary capability locations include Forward Arming and Refueling Points (FARP) and the hub-and-spoke basing approach. In the FARP approach, aircraft are stationed at a main operating base—outside the enemy's threat ring—and periodically land, rearm, and refuel at forward bases to increase sortie generation rates (see Figure 2, below).

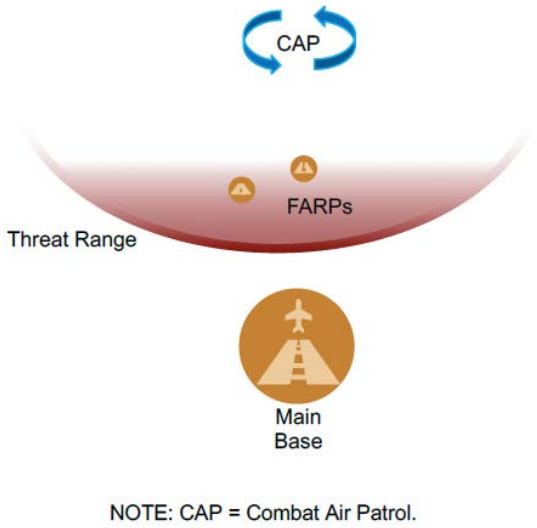

Figure 2. Forward Arming and Refueling Point Basing Approach

Source: Patrick Mills et al., *Building Agile Combat Support Competencies to Enable Evolving Adaptive Basing Concepts* (Santa Monica, CA: RAND Corporation, 2020), 21.

[28] Patrick Mills et al., *Building Agile Combat Support Competencies to Enable Evolving Adaptive Basing Concepts* (Santa Monica, CA: RAND Corporation, 2020), 21, accessed February 16, 2021, https://www.rand.org/pubs/research_reports/RR4200.html.

In the hub-and-spoke basing approach, one or more main operating bases—the hub—are led by an air expeditionary wing (AEW) commander, or higher, who provides a C2 conduit between the spokes and higher echelon forces, located in the rear. Spokes are airfields, typically forward of the hubs, with varying levels of operational and sustainment capability. It differs from the FARP approach in that the main operating base of the hub-and-spoke approach is under the same level of threat that the spokes are. So, rather than standoff, the hub-and-spoke approach relies on redundancy and resilient bases.[29]

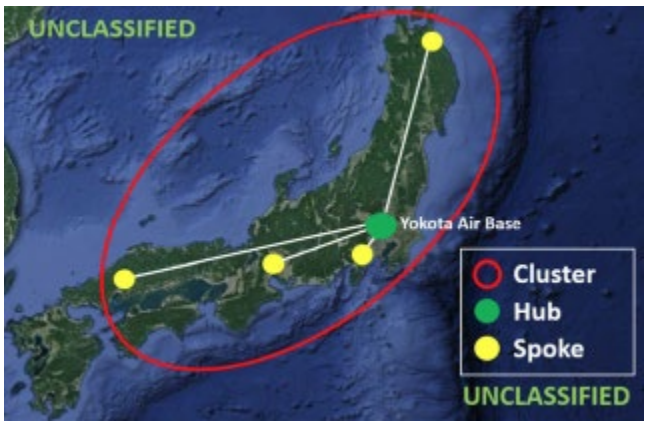

Figure 3. Notional "Regional Cluster" in Japan

Source: United States Pacific Air Forces, "PACAF ACE Annex," 9.

Equal capability locations, on the other hand, have similar sustainment services at every base. Equal capability locations include cluster basing and shell game basing approaches. The cluster basing approach—not to be confused with PACAF's adaptive cluster operations—calls for operating a small force from a greater number of equal capability bases. This approach primarily relies on resiliency operations such as "on-base dispersal of aircraft…resilient fuel storage, and advanced runway repair capabilities."[30] Consequently, from the enemy's perspective, no single base represents a higher-value target than any other base since each base has an equivalent

[29] Patrick Mills et al., *Agile Combat Support Competencies*, 23.

[30] Ibid., 24.

capability and aircraft disposition. The shell game basing approach also utilizes a large number of equal capability bases, except rather than operating statically, forces dynamically move from base to base to complicate or evade enemy targeting. Rather than relying on resilient bases for survivability, the shell game basing approach would create more bases than required and rely on unpredictable movement for survivability.[31]

These four different basing approaches each have their strengths and weaknesses. Depending on the theater, enemy, or phase of operations, theater commanders might choose one basing approach over the other three. Conversely, to present a further layer of uncertainty and unpredictability to the adversary, theater commanders might decide to integrate all four basing approaches across one theater. Regardless of the chosen basing approach, local commanders require multi-disciplinary personnel to run the base.

Multi-Capable Airmen

The final subordinate ACE concept pertinent to this monograph is the Multi-Capable Airmen (MCA) concept. Traditionally, Airmen are trained in one specialty and, aside from minor additional duties, are not responsible for tasks outside their specialty. This model has worked relatively well in past conflicts where operating bases have expansive infrastructure, are exposed to a minimal threat, and include personnel services sufficient to support a large population. In recognizing that this traditional basing approach is not survivable in contested environments, the Air Force has developed the MCA concept. In this concept, airmen perform additional tasks outside of their core specialty to support air forces that operate dynamically from dispersed bases across the theater. These airmen receive specific training for one of three cross-functional teams: mission generation, base operating support-integrator (BOS-I), and command and control.[32]

[31] Patrick Mills et al., *Agile Combat Support Competencies*, 25.

[32] United States Pacific Air Forces, "PACAF ACE Annex," 11.

Thus, the MCA concept effectively reduces the manning footprint required at each location, making the ACE concept leaner from a personnel perspective.

Chapter Conclusion

Invariably, there will be those that find fault with the preceding explanation of ACE. It is important to remember that in 2021 this concept is experimental, it is changing every day, and it is being independently developed by ACC, PACAF, USAFE, and wings across the Air Force. Disputes on specific terms, procedures, and theater applicability are to be expected. Despite these differences, every stakeholder would likely agree that ACE's core concept takes a once static air force and turns it into a survivable and sustainable mobile air force. With this baseline understanding of ACE, this monograph now turns to the Ninth Air Force in World War II to fulfill this monograph's primary purpose.

Chapter Three

ALGs in the ETO: Normal Operations

> The success of the airfield construction engineers in building the fields, of the maintenance personnel in servicing the aircraft moved in, and of the supply organisation which provided the necessary equipment ensured that complete air superiority over the battle zone was never lost, even temporarily and a striking force was always available.
>
> —Air Staff, Headquarters Allied Expeditionary Air Force, *A Review of Air Operations Preparatory to and in Support of Operation "Neptune"*

Background

The Casablanca Conference of January 1943 effectively set the cross-channel invasion of the European continent for the Spring of 1944. At this conference, Air Chief Marshal Charles Portal noted that the Royal Air Force and the Eighth Air Force "operate from static bases" and that "mobile air units must be organized to support cross-channel operations."[33] Four months later, at the Trident Conference, May 1943, the Combined Chiefs of Staff (CCS) set April 1, 1944, as the target date for the cross-channel operation and approved the "Plan for Combined Bomber Offensive (CBO) from the United Kingdom."[34] In this plan, the CCS stated that in order to supplement the strategic bombing force, "in providing the close support required for the surface operations, steps must be taken early to create and train a tactical [air] force in this theater."[35] Thus, these two conferences effectively established the requirement for mobile, tactical air forces of the United Kingdom and the United States.

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[33] US Department of State, *J.C.S. Files Document 370: Combined Chiefs of Staff Minutes, January 21, 1943, 10 a.m.*, Foreign Relations of the United States: The Conferences at Washington, 1941-1942, and Casablanca, 1943 (Washington, D.C.: Government Printing Office, 1968), 676.

[34] US Department of State. *CCS 215: Invasion of the European Continent from the United Kingdom in 1943-1944*, Trident Conference: Papers and Minutes of Meetings (Washington, D.C.: Combined Chiefs of Staff, May 1943), 2.

[35] US Department of State. *CCS 217: Plan for Combined Bomber Offensive from the United Kingdom*, Trident Conference: Papers and Minutes of Meetings (Washington, D.C.: Combined Chiefs of Staff, May 1943), 22.

Following the Casablanca Conference decisions, the CCS appointed Lieutenant General Sir Frederick E. Morgan the chief of staff to the supreme Allied commander (COSSAC) and tasked him with creating an "outline plan" for the cross-channel operation, Operation Overlord.[36] In his plan, Morgan and his staff designated the opening phase's objective "to effect a landing in the CAEN sector with a *view to the early capture and development of airfield sites in the CAEN area* [emphasis added], and of the port of CHERBOURG."[37] This "outline plan" stated that "in order to increase the speed at which air action, both offensive and defensive can be undertaken, air forces must be built up as rapidly as possible in the lodgement [sic] area."[38] Furthermore, the plan outlined a phased buildup of airfields between D+3, with two airfields, to D+14, with fourteen airfields.[39] Thus, this outline plan initiated the system in which fighter groups would deploy to aviation engineer-built airfields on the continent and provide air superiority and close support to the Allied ground forces.

Planning

Overall air planning for Operation Overlord was the responsibility of the Allied Expeditionary Air Force (AEAF) in Stanmore, England, commanded by Air Marshall Sir Trafford Leigh-Mallory.[40] Several organizations and staff elements within Ninth Air Force contributed to the AEAF planning syndicates, which were organized by subject: overall air plan,

[36] Craven and Cate, *Europe: Argument to V-E Day*, 3.

[37] F.E. Morgan, Lieutenant General, *COSSAC (43) 28: Operation "OVERLORD"* (Norfolk House, St. James Square, England: Headquarters, Chief of Staff to the Supreme Commander, July 15, 1943), 29.

[38] Ibid., 35.

[39] Ibid.

[40] Wesley Frank Craven and James Lea Cate, eds., *Europe: Torch to Pointblank, August 1942 to December 1943*, The Army Air Forces in World War II (Washington, D.C: Office of Air Force History, 1983), 634.

airfields, or intercommunications, for example.[41] As part of the planning, the engineer section of IX Engineer Command drew up the designs for four types of airfields.[42]

First, Emergency Landing Strips (ELS) were 2,000 ft rough graded strips designed to provide an area for tactical aircraft to perform an emergency belly-landing on. Second, Refueling and Rearming Strips (R&R) had one runway, typically 3,600 ft long, with two marshaling areas on either side of the runway. R&R strips had enough infrastructure to refuel and rearm aircraft near the front lines but not to operate from indefinitely. The third type of airfield was an Advanced Landing Ground (ALG). The ALG was an R&R field with additional dispersal facilities, access roads, and added storage facilities. Finally, the fourth type of airfield was a Tactical Air Depot (TAD). A TAD further expanded an ALG by adding hangars, shops, hardstands, and additional roads.[43] The planning for the locations of each type of airfield is broken up into two distinct phases and procedures: D-Day to D+14 and after D+14.

In the first phase, Neptune planners took the general requirement described in COSSAC's outline plan for Overlord and added a significant amount of detail: phased airfield buildup, location, timing, and surfacing material. At Omaha Beach, Neptune called for: one ELS on D-Day; two R&R untracked strips by 1200 hours on D+3 to be tracked by 1200 hours on D+4; four ALGs by D+8, two of which would be further developed from the two D+4 R&R strips; and one more ALG by 0600 hours on D+14. At Utah Beach, Neptune called for: one ELS on D-Day; one ALG by 0600 hours on D+8; and two more ALGs by 0600 hours on D+14.[44]

The intelligence section (A-2) of IX Engineer Command was responsible for assembling and disseminating an intelligence dossier on the prospective airfields in Neptune. The dossier

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[41] The Ninth Air Force, *Ninth Air Force Invasion Activities: April Thru June 1944*, February 17, 1945, 23.

[42] Latendresse et al., *IX Engineer Command History*, 25.

[43] Ibid., 25–26.

[44] Ibid., 53–54.

contained current aerial reconnaissance photographs, differing types of maps—including general, geological, natural resources, and communication line maps—the operation section's (A-3) estimate of work, and enemy military disposition and strength information. To ensure the teams were adequately prepared, the general intelligence information was issued to engineer aviation battalions weeks in advance, while the more time-sensitive intelligence information was disseminated immediately before D-Day.[45]

In the subsequent phase after D+14, Neptune outlined much more general requirements for airfield construction timeline and specifications. First, Neptune called for additional ALGs to be constructed to provide for "a total of twelve fighter and fighter/bomber groups and two Night Fighter Squadrons by D-plus-25, and 20 groups by D-plus-40. Such fields to be located at all times, so as to provide the closest possible support to the ground forces."[46] Second, one TAD would be constructed approximately every fifteen days, starting on D+28, at a location to be coordinated with IX Air Force Service Command (AFSC). Third, five hard-surface fields would be constructed or rehabilitated for medium-bombers by D+90. Finally, Neptune stated that "the locations and operational dates for particular ALGs after the initial period cannot be specified, as this will depend upon the tactical situation and the results of ground reconnaissance of potential airfield sites."[47] After the St. Lô breakout and pursuit in late July 1944, planning for new airfields was predicated on First and Third Army's rapid advancement.

On learning that First or Third Army planned a future operation, Ninth Air Force would determine whether or not the "center of gravity" of one of the Tactical Air Commands (TAC) needed to move as well.[48] If the ground forces' movement placed the Fighter Groups of the TAC outside of sixty miles from the front line, Ninth Air Force would notify IX Engineer Command of

[45] Latendresse et al., *IX Engineer Command History*, 23.

[46] Ibid., 54.

[47] Ibid.

[48] Ibid., 97.

the pending requirement for more airfields.[49] The A-2 and A-3 sections of IX Engineer Command would develop a "goose-egg" map depicting possible locations that would support the pending move, along with probable airfield operational dates. This plan was then briefed to the Ninth Air Force commander for approval.[50] Following approval, Ninth Air Force Staff would coordinate with applicable subordinate units—IX Engineer Command, IX Air Force Service Command, and the affected Tactical Air Command—to coordinate the move.

Building and Rehabilitating ALGs: IX Engineer Command

Once the Ninth Air Force commander approved the move plan, the IX Engineer Command (IX EC) headquarters (HQ) would task one of two engineer aviation brigades (EAB) based on location, either the 1st or 2nd EAB. The EAB was purely an operational command. The division of labor between the two brigades was geographically based on TAC and Army boundaries. Thus, 1st EAB built airfields for IX TAC, which supported First Army, and 2nd EAB built airfields for XIX TAC, which supported Third Army.[51] Additionally, EAB headquarters, to the maximum extent possible, were located within a few miles of Army headquarters and TAC headquarters.[52] This gave the brigades a lateral connection to the TAC's desire to move their center of gravity as well as the vertical connection already established up to the Ninth Air Force.

[49] Latendresse et al., *IX Engineer Command History*, 46.

[50] Ibid., 97–98.

[51] Ibid., 188.

[52] Ibid.

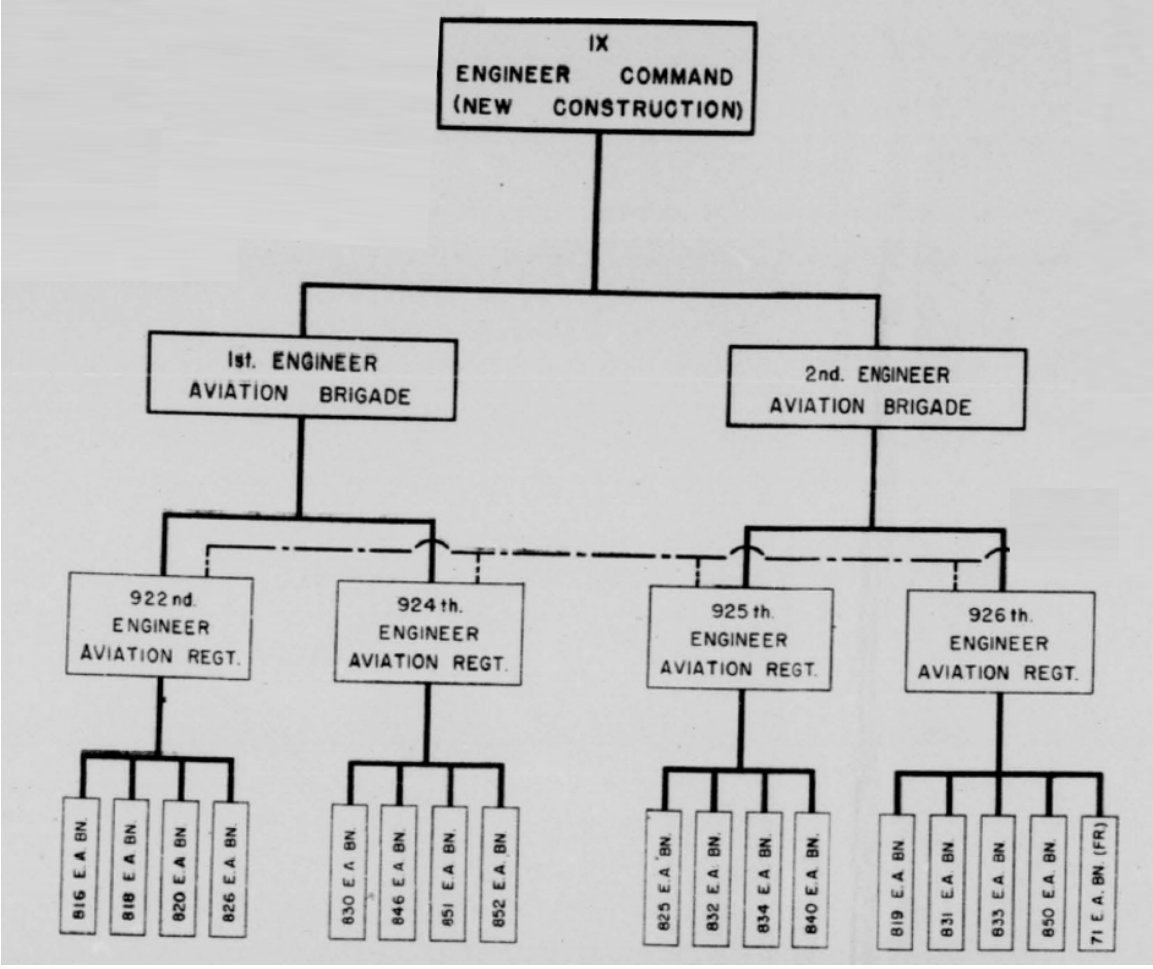

Figure 4. Organizational Chart of IX Engineer Command

Source: The Ninth Air Force, *The IX Engineer Command in the European Theater of Operations: Operating Procedure and Functional Organization*, The Ninth Air Force and its Principal Commands in the European Theater of Operations, 1945, chart 1.

The EAB would then task one of its four engineer aviation regiments (EAR); the 922nd, 924th, 925th, or the 926th EAR. The EAR primarily served as an administrative command but also organically owned heavy construction equipment, which it used to reinforce a particular battalion assigned to a large job.[53] The EAR would then order one of its four engineer aviation battalions to each prospective airfield location.

[53] Latendresse et al., *IX Engineer Command History*, 187.

The engineer aviation battalion was the core unit of IX Engineer Command, designed and equipped to handle all matters relating to constructing one airfield at a time. During the buildup of battalions for the fledgling IX Engineer Command, created in 1943, each battalion received two months of training in England. Training included courses in camouflage, mines and booby traps, signal communications, and practical applications in ALG construction.[54] Additionally, the IX Engineer Command received only the battalions with considerable construction experience, ten of which had been in England since 1942.[55] Some battalions gained unique experiences—such as concrete or asphalt—which specialized them; however, each battalion was assumed interchangeable with the other battalions.[56]

The construction order given to the battalion would typically come with a IX Engineer Command A-2 intelligence dossier for each of the general locations. These dossiers were similar to the ones created before D-Day, although with much less detail.[57] Once the engineer aviation battalion received their airfield assignment—either a general location or a specific site—the battalion would send a ground reconnaissance team to reconnoiter the site. If the site was found suitable and the battalion was ready, the regiment would coordinate with IX Engineer Command for their construction supplies and heavy equipment to be sent to the prospective airfield, and the battalion would begin their move to their construction site.

Once the assigned battalion was at the construction site, work began immediately—assuming their equipment and supplies were also at the site. While each construction site was unique, work was divided into two types of sites: virgin sites and rehabilitated airfields captured

[54] Latendresse et al., *IX Engineer Command History*, 17.

[55] Ibid., 16.

[56] Ibid., 148.

[57] Ibid., 23.

from the enemy.[58] In either type of site, the battalion prioritized their work in the same manner, although some steps would take longer than others, depending on the site type.

The first priority was to build or repair the runway. Workers would first "clear, grub, grade, and roll" a 240 x 3,600-foot (or 5,000-foot) landing strip. They then added another 240 feet in length on either side for an overrun and two 300 x 150-foot marshaling areas on either side of the landing strip. After the landing strip was complete, engineers would clear, grade, and roll a 40-foot-wide taxi track adjacent to the runway. The final step was surfacing each marshaling area and then a 120-foot-wide section of the landing strip to form the runway.[59]

Throughout the ETO, battalions utilized four types of surfacing materials: square-mesh track (SMT), prefabricated hessian surfacing (PHS), pierced steel plank (PSP), and rehabilitated hard surfacing. SMT was a relatively light material that used heavy wire welded together in a mesh pattern, forming three-inch squares. The material was stored in long rolls, which were unfurled, connected with wire clips, and stretched by trucks to remove any billowing.[60] Aside from an unsurfaced runway, SMT was the least desirable surfacing material due to dust in dry seasons and mud in wet seasons. PHS was preferred to SMT, but its availability was limited by production in the early phases of the invasion. Once supply caught up with demand, PHS was the primary surfacing material used by IX Engineer Command. PHS was lighter than SMT, formed in 300-foot rolls of 36- to 43-inch-wide hessian cloth, and coated with bitumen, which made it an all-weather surfacing material.[61] It provided no load-bearing capacity on its own; it merely protected the subgrade from the rain and the wind. While PHS was weatherproof, it was required

[58] Latendresse et al., *IX Engineer Command History*, 159.

[59] Ibid., 149.

[60] Ibid., 151.

[61] David C. Johnson, *AAF Continental Airfields (ETO) D-Day to V-E Day* (Maxwell AFB, AL: USAF Historical Research Center, Research Division, 1988), 7; Latendresse et al., *IX Engineer Command History*, 151–152.

to be installed on a dry surface. Thus, once the fall rains began, engineers ceased using PHS in favor of either PSP or captured hard-surfaced enemy airfields.[62]

Figure 5. ALG Example – Saint-Pierre-du-Mont (A-1)

Source: "American Air Museum in Britain," accessed April 1, 2021, http://www.americanairmuseum.com/media/16643.

PSP, also known as "Marston mat," consisted of 10-foot x 15-inch steel planks connected and laid perpendicular to the runway's direction.[63] PSP was the most desirable surfacing material for virgin sites, but its weight and availability restricted its use to medium bomber fields in the invasion's opening phases. Only after the medium bombers began using captured hard-surfaced

[62] Latendresse et al., *IX Engineer Command History*, 151–154.

[63] Johnson, *AAF Continental Airfields*, 6.

enemy airfields and the fall rains forbid the installation of new PHS ALGs, did engineers begin surfacing fighter-bomber ALGs with PSP.

Finally, hard-surface runways were the most advantageous due to time savings in reconnaissance, construction, and maintenance, as well as its increased load-bearing capacity and all-weather characteristics. Once the enemy was driven from the field, the engineers' primary work was to remove mines and booby traps, clear debris, and repair craters on the runway induced either by Allied bombing or German demolitions.[64] Initially, mines, booby traps, and enemy demolitions were extensive; however, following the breakout and the Allied rapid advancement, some enemy airfields were abandoned so quickly that the Germans failed to detonate planned demolitions or set up adequate minefields and booby traps.

By the end of the war, there were 182 American airfields still in operation on the continent, stretching from Normandy's beaches to Salzburg, Austria.[65] The engineer aviation battalions of IX Engineer Command were the workhorse for this operation. Their engineers encountered a myriad of challenges, some of which are discussed in chapter four. They often worked under fire, had to dodge and clear minefields and booby traps, and always worked under the extreme pressure of time. In the end, the command built 241 airfields which proved to be paramount for tactical support, supply, and evacuation for the Army.[66]

IX Air Force Service Command Organization

The command’s headquarters was separated into four divisions: personnel and training, maintenance, supply, and transportation.[67] The command had two Advanced Air Depot Area’s

[64] Latendresse et al., *IX Engineer Command History*, 154.

[65] Craven and Cate, *Europe: Argument to V-E Day*, 572.

[66] Latendresse et al., *IX Engineer Command History*, 146.

[67] IX Air Force Service Command, *History of the IX Air Force Service Command (16 October 1943 to V-E Day)*, n.d., 6.

(AADA) below the headquarters, each responsible for the supply and maintenance of a particular aircraft category, shown below in Figure 7.[68]

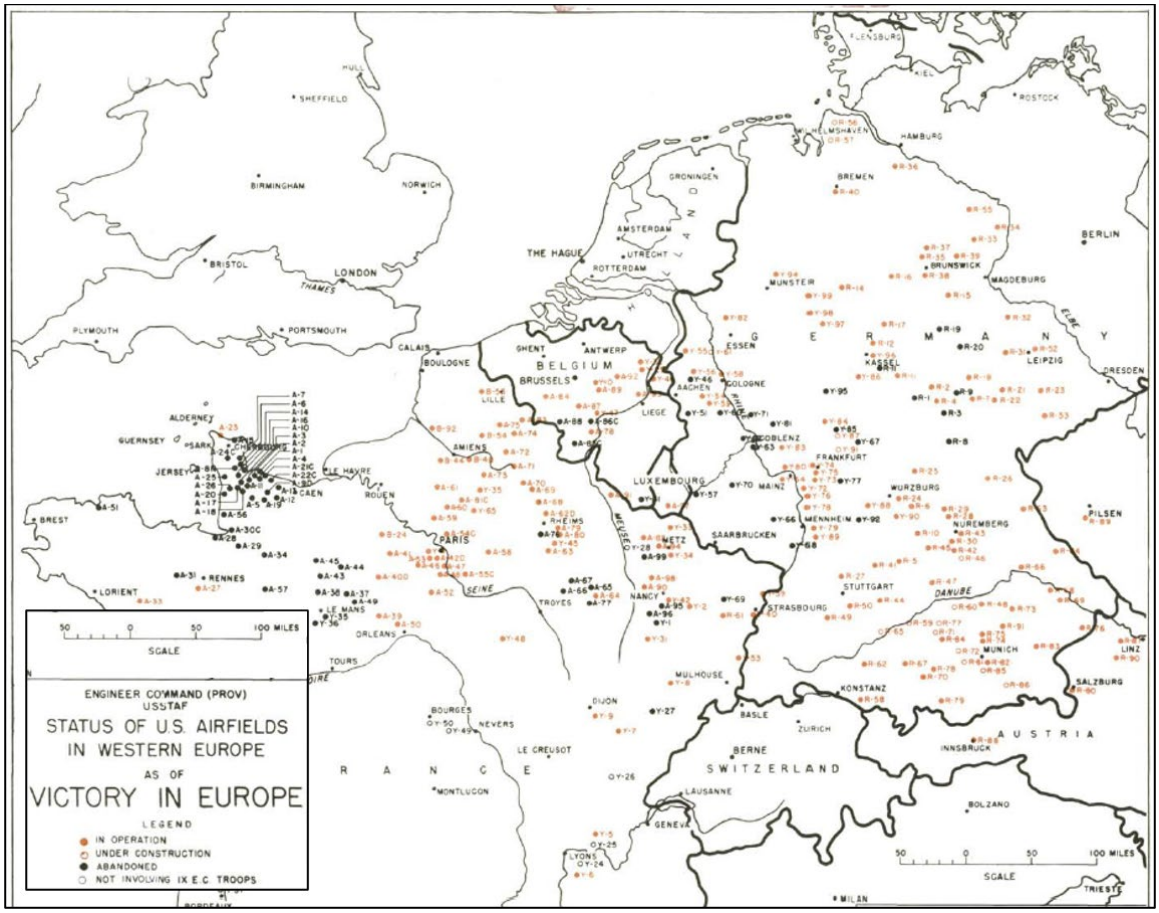

Figure 6. Status of US Airfields in Western Europe as of V-E Day

Source: Jacob E. Fickel Maj. Gen. et al., *The Effectiveness of Third Phase Tactical Air Operations in the European Theater*: 5 May 1944 - 8 May 1945 (Orlando Army Air Base, Florida: The Army Air Forces Evaluation Board in the European Theater of Operations, August 1945), 327–328.

Supply and Maintenance

While the engineer aviation battalions were responsible for building the fighter groups' airfields, neither the construction of nor the operations on the airfields would be possible without

[68] Ibid., 9.

adequate supplies, equipment, transportation, and maintenance. Such was the job of Ninth Air Force's IX Air Force Service Command (AFSC).

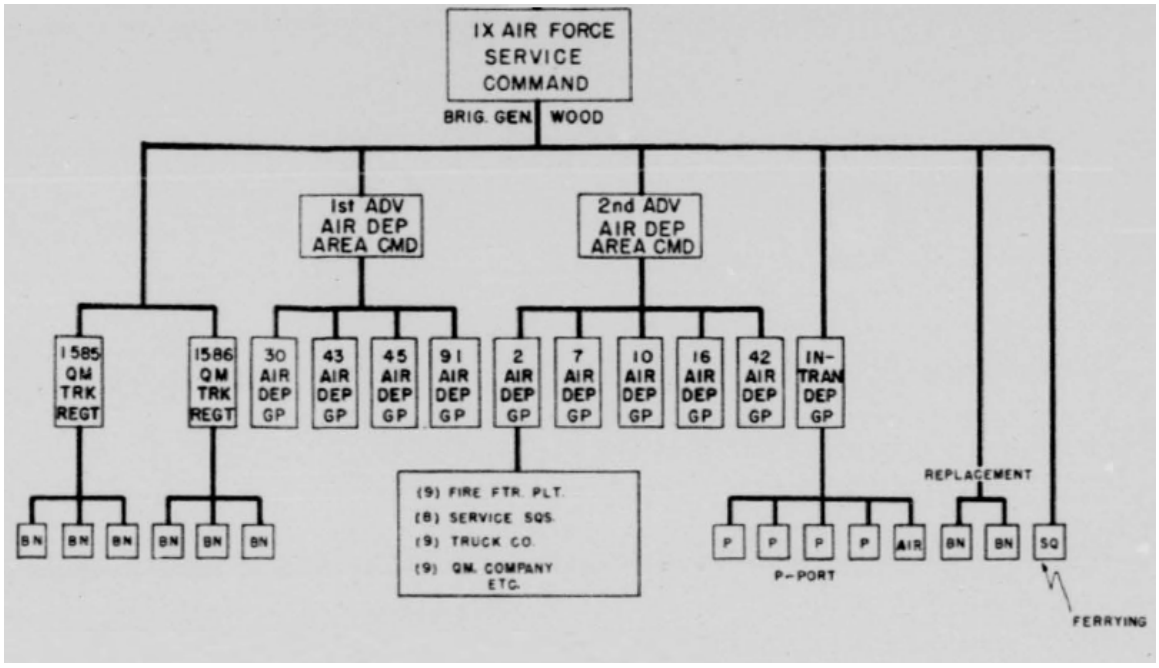

Figure 7. Organizational Chart of IX Air Force Service Command

Source: The Ninth Air Force, *The IX Engineer Command in the European Theater of Operations: Operating Procedure and Functional Organization*, The Ninth Air Force and its Principal Commands in the European Theater of Operations, 1945, 42.

Under the two AADAs were six Tactical Air Depots (TAD). Each TAD was comprised of two Air Depot Groups (ADG), the senior commander of which also commanded the TAD.[69] The TADs and ADGs were integral parts of IX AFSC, which existed solely to supply and maintain the combat groups of which they were assigned.[70] Each TAD was designed to supply and maintain a specific type of aircraft. For example, the 5th TAD at Chilbolton, England, and the 6th TAD at Membury, England, specialized in the P-47 Thunderbolt.[71] To accomplish the ADG's

[69] Ibid., 17.

[70] IX Air Force Service Command, *IX AFSC History*, 9, 16.

[71] Ibid., 15.

primary task, its supply squadron was authorized a ninety-day stock of supplies—although it rarely maintained such a level—and its repair squadron conducted the fourth echelon maintenance for its particular aircraft specialty.[72]

Next, the TAD had "technical control" over the next and lowest echelon of command, the service group. Similar to the command structure of the TAD and ADG, the service group was split into two service teams where the senior team commander also served as the service group commander. The service team was the "field unit" of IX AFSC, who serviced and was stationed with one fighter group. The service teams were further subdivided into squadrons, sections, and shops, each with its own function and specialty, but, in general, each subordinate unit of the service team contributed to either supplying or maintaining their assigned fighter group.[73]

Finally, perhaps the most essential supply and maintenance organization was not even part of IX AFSC: the airdrome squadron. These squadrons were assigned to one of the Tactical Air Commands (TAC)—IX, XIX, or XXIX TAC—and were designed to bridge the gap between aviation engineer airfield construction and fighter group operations. The airdrome squadron's approximately 300 personnel would arrive at the airfield a few days before completion, bringing with them "ten-day pack-up kits" issued by IX AFSC.[74] Chief among their initial responsibilities was to set up and stock fuel, ammunition, and supply depots. Once the airfield was set up and the fighter group's air echelon arrived, the airdrome squadron and their initial supplies would be sufficient to perform first and second echelon maintenance and provide supplies until their ground echelon—including the service team—arrived on the field. After the fighter group took over the airfield, the airdrome squadron would pack up, move on to the next airfield, and repeat the cycle. Most airdrome squadrons were in one place for only ten days and then moved on the

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[72] Ibid., 9.

[73] Ibid., 17–28.

[74] 9th Airdrome Squadron, "9th Airdrome Squadron History Installment for June 1944," July 7, 1944, Reel A0514A, Air Force Historical Research Agency (AFHRA); Craven and Cate, *Europe: Argument to V-E Day*, 132.

heels of the engineer aviation battalions. The 83rd Airdrome Squadron, for example, moved thirteen times between D-Day and V-E Day, from A-2 in Cricqueville, France, to R-29 in Herzogenaurach, Germany.[75]

Aviation Fuel

The most distinctive element of the aviation fuel (Avgas) supply is that it was designed to be completely supplied and transported by the Army, executed by the Communications Zone (COMZ). The plan for all petroleum, oil, and lubricant (POL) products in the ETO was finalized on April 14, 1944, by the POL Branch, G-4, European Theater of Operations, US Army.[76] This plan was centered around two pipeline systems, called the minor and major systems that would provide bulk POL. The minor system was to be constructed first—scheduled to be complete by D+15—at a small port in the Normandy region, Port-en-Bessin. From the port, fuel was offloaded from tankers and discharged through a 6-inch pipe to a "tank farm" at Mt. Cauvin, which had a capacity of 24,000 barrels.[77] From Mt. Cauvin, a 4-inch pipe was to run thirteen miles to the south and terminate at Balleroy, where COMZ personnel could fill cans or load fuel trucks.[78] The major system had a similar design but, as its name implies, had much more capacity. It was centered around Cherbourg's port and was thus predicated on its capture before construction could begin. Eventually, the major system's pipelines would extend south to Fougères and then west into the Brittany peninsula and to the East to Janville, south of Paris.[79] The plan called for the initial construction of the major system to be complete by D+21, which would give La Haye-du-Puits POL storage and dispensing capability. While these two systems were being constructed,

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[75] 83rd Airdrome Squadron, "83rd Airdrome Squadron History," June 8, 1945, Reel A0516, Air Force Historical Research Agency (AFHRA).

[76] Roland G. Ruppenthal, *Logistical Support of the Armies: Volume I: May 1941-September 1944*, United States Army in World War II: The European Theater of Operations (Washington, D.C.: Center of Military History, 1953), 321.

[77] Ibid., 322–323.

[78] Ibid., 323.

[79] Roland G. Ruppenthal, *Logistical Support: Volume I*, 316–317.

the plan called for POL to be shipped "packaged"—in jerry cans—for the first twenty-one days of the invasion.

In execution, the packaged Avgas through Utah and Omaha beaches went as planned. Like other supplies, the VIII Intransit Depot Group—later renamed the 1st Intransit Depot Group—would identify, segregate, and prepare Avgas for shipment. COMZ or IX AFSC would then transport the packaged Avgas to the ALGs.[80] Since Ninth Air Force was operating out of a relatively few number of ALGs in the first few weeks, the Avgas supply and transportation went relatively smooth. So much so that on June 22nd, Colonel Bernerd F. Johnson, the chief air force petroleum officer, found the "aviation fuel supply on the Continent…in excellent shape."[81] Although, that assessment would prove premature.

Once the major and minor systems were operational on July 23rd, shipments and use of packaged Avgas diminished. From the closest pipeline terminus, COMZ would transport the Avgas via truck or rail to the nearest advance dump, which COMZ and Ninth Air Force agreed would be within forty miles of the ALG to be serviced.[82] From the advance dump, airdrome squadrons or service teams would transport the bulk Avgas to the IX Engineer Command built storage facility on each ALG.[83]

Transportation

Supplying the necessary ordnance, ammunition, construction materials, equipment, general supplies, and Avgas created immense transportation requirements. As in the Avgas section above, the Army's COMZ—owning the vast preponderance of motor vehicles and all railways—was contracted to transport supplies from the ports and beaches to advance dumps or

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[80] Craven and Cate, *Europe: Argument to V-E Day*, 577.

[81] Ibid., 583.

[82] IX Air Force Service Command, *Functional History of IX AFSC (Draft)*, n.d., 26; Craven and Cate, *Europe: Argument to V-E Day*, 573.

[83] IX Air Force Service Command, *IX AFSC History*, 242; Craven and Cate, *Europe: Argument to V-E Day*, 583–584.

ADGs within forty miles of the user.[84] From these advance dumps or ADGs, Ninth Air Force motor vehicles brought the supplies the rest of the way to the ALGs. While COMZ controlled all rail transportation and most motor transportation, IX AFSC had at its disposal its own organic motor and air transport capability.

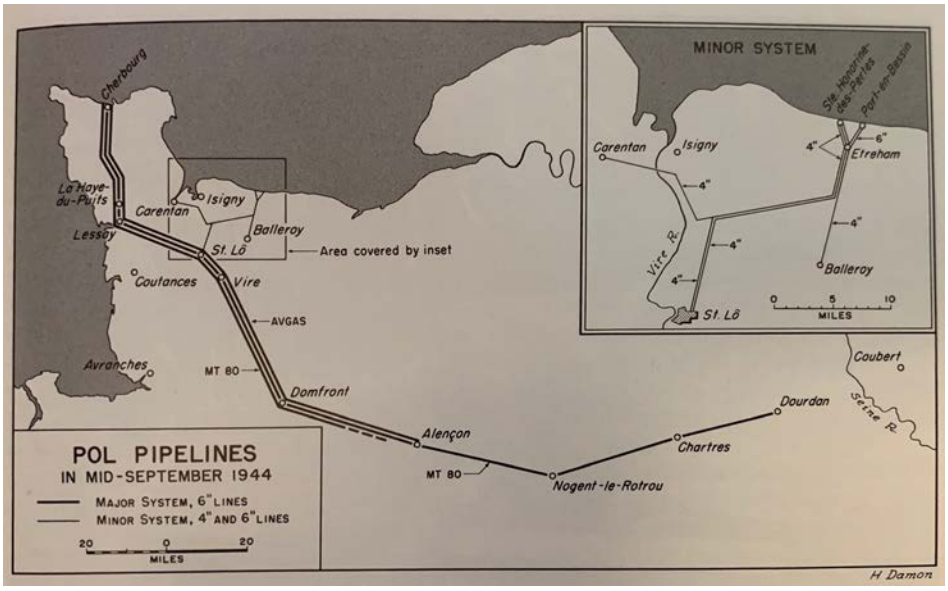

Figure 8. POL Pipelines in Mid-September 1944

Source: Roland G. Ruppenthal, *Logistical Support of the Armies: Volume I: May 1941-September 1944*, United States Army in World War II: The European Theater of Operations (Washington, DC: Center of Military History, 1953), 511.

Their motor transport capability came in their fifty-eight QM truck companies, originally distributed amongst the ADGs and service teams. Before D-Day, IX AFSC foresaw a need for centralized control of their QM truck companies. So, they removed half of their QM truck companies and created two QM truck regiments, later redesignated QM Truck Groups (Avn.)—the 1585th and 1586th—in August 1944. Each group was assigned three battalions, and each battalion had an average of four QM truck companies.

[84] Ibid., 578; IX Air Force Service Command, *IX AFSC History*, 26.

IX AFSC's air capability came in their organic 1st Transport Group (Provisional) and through support from the US Strategic Air Force's 302nd Transport Wing, which owned the 27th and 31st Air Transport Groups.[85] These three transport groups were responsible for the logistical support to Ninth Air Force and the Allied ground forces. Due to the fighter group's speed of advance, the transport group's primary task was to transport fighter group personnel, equipment, and supplies from one ALG to the next.[86] For example, between June 1944 and May 1945, the three transport groups carried nearly 90,000 tons of cargo, most of which was for the Ninth Air Force.[87]

Fighter Group Operations and Maintenance

As discussed in this chapter's background section, a mobile tactical air force requirement was established as early as January 1943. As such, the fighter groups slated to deploy to the ETO made a concerted effort to train to the procedures and conditions of mobile warfare on the continent. Once on the continent, each fighter group operated nearly the same.

First, upon being notified, the fighter group would prepare for the pending move. The move would occur in three echelons. The advance echelon moved first, consisting of a few officers and enlisted men. This echelon would link up with the airdrome squadron already in place and help prepare the field for the rest of the fighter group. The next echelon to arrive was the air echelon, consisting of all the airplanes and most pilots. As discussed previously, the airdrome squadron would service and maintain the planes until the final echelon—the ground echelon—arrived. This system of sending three echelons and utilizing the airdrome squadron for the transition minimized any impact to operations on the continent. Combat missions could

[85] Craven and Cate, *Europe: Argument to V-E Day*, 558.

[86] Ibid., 560.

[87] Ibid.

realistically launch the same day that the air echelon arrived at the field. Once all three echelons were in place, operations and maintenance went back to steady-state.[88]

Maintenance for the combat aircraft was broken up into four echelons. First echelon maintenance consisted of "servicing airplanes and airplane equipment, preflight and daily inspections, and minor repairs, adjustments, and replacements."[89] Second echelon maintenance consisted of "servicing airplanes and airplane equipment, performance of the periodic preventative inspections, and such adjustments, repairs, and replacements as may be accomplished by the use of hand tools and mobile equipment."[90] These first two echelons of maintenance were performed by the fighter group maintenance personnel, or the airdrome squadron, before the ground echelon's arrival. Third echelon maintenance consisted of "repairs and replacements requiring mobile machinery and other equipment of such weights and bulk that ground means of transport is necessary."[91] The engineering section of the service squadron assigned to the fighter groups typically conducted third echelon maintenance. Finally, fourth echelon maintenance—undertaken primarily by the ADGs—consisted of "all operations necessary to completely restore worn or damaged aircraft to a condition of tactical serviceability and the periodic major overhaul" of major aircraft systems.[92]

Chapter Conclusion

This chapter has outlined the process by which ALG's were built, rehabilitated, and supplied and how the fighter groups operated and were maintained between D-Day to V-E day. To summarize the process, engineer aviation battalions of IX Engineer Command built new airfields from virgin sites or rehabilitated airfields captured from the enemy. Once near

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[88] Steve Blake, *The Pioneer Mustang Group: The 354th Fighter Group in World War II* (Atglen, PA: Schiffer Military History, 2008).

[89] IX Air Force Service Command, *IX AFSC History*, 2.

[90] Ibid.

[91] Ibid.

[92] Ibid., 2, 9.

completion, airdrome squadron personnel set up the airfield and initially supplied and maintained the fighter groups. Once fighter groups took control of the airfield, normal operations commenced from the ALG, and the cycle repeated itself. All of this was underwritten by IX AFSC and COMZ. The preceding narrative might give the impression that these Ninth Air Force units did not encounter any challenges along the way, but this was not the case. Of course, challenges and problems abounded over the eleven months that Ninth Air Force support organizations enabled the fighter groups to contribute to the Wehrmacht's defeat. Such challenges, problems, and solutions are the subject of the following chapter.

Chapter Four

ALGs in the ETO: Challenges, Solutions, and Modern Applicability

> IX TAC still has a big job to do, but I am confident that every man will give more than that extra "10 percent" of his energies which puts more planes in the air, and will, in the final analysis, hasten the day when the German doughboy will cry "Achtung, Jabos" for the last time.
>
> —Major General Elwood "Pete" Quesada, *Achtung Jabos, The Story of the IX TAC*

Introduction

In the eleven months between D-Day and V-E Day, the Ninth Air Force built, rehabilitated, and supplied 241 airfields on the continent.[93] Ultimately, tactical airpower support enabled the US First, Third, and Ninth Armies to drive the Wehrmacht from Normandy's beaches to the Rhine and into Germany. While the previous chapter presents a seemingly flawless design and well-oiled machine, devoid of any challenges, these feats were not accomplished without *significant* challenges.

These challenges that the Ninth Air Force faced and their solutions offer many lessons for the Army Air Force of May 1945. However, with changes in technology, doctrine, and circumstances, the question is: what lessons apply to the Air Force of 2021? This chapter presents *some* of the challenges and solutions that contemporary planners might find relevant to future ACE operations and a brief explanation of how each lesson *might* apply to the modern Air Force. For organization and ease of presentation, the challenges, solutions, and their modern applicability are categorized using some of the joint functions, beginning with movement and maneuver.

[93] Latendresse et al., *IX Engineer Command History*, 146.

Movement and Maneuver: Positioning ALGs in "Clutches"

When the Ninth Air Force decided to move a fighter group to a newly built or rehabilitated ALG, they did so by considering several factors. The first and most driving factor has already been discussed in chapter three; the disposition of current ALGs compared to the current or planned Army advance. To meet this first driving factor, IX Engineer Command need only locate the new ALG within sixty miles of the front line.[94] This, however, still left the important question of where to place the ALGs *laterally* unanswered. Arguably the second driving factor to the question of where to locate new ALGs was command and control.

Consequently, Ninth Air Force had to solve the challenge of maintaining a mobile, tactical air force while adhering to the fledgling, and incomplete, tenet of airpower: centralized control.[95] Before the St. Lô breakout, this question bore very little significance, as IX Engineer Command developed ALGs wherever their ground reconnaissance parties could find a suitable location within the confined space in the Normandy beachhead. Once the Allies broke through the German lines at St. Lô, the Ninth Air Force had much more freedom, and the question of how to ensure centralized control while maximizing the mobility of the tactical air force became a challenge.

As a solution, the Ninth Air Force enacted a policy whereby ALGs would be grouped into "clutches" of four to five ALGs—each initially housing only one fighter group—to accommodate the fighter groups of one TAC.[96] While there was a recent historical precedent of utilizing clutches for the Eighth Air Force in England, developing ALGs into clutches made sense to the Ninth Air Force because it enabled centralized control while also centralizing

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[94] Latendresse et al., *IX Engineer Command History*, 46.

[95] US Department of War. *Field Manual (FM) 100-20, Field Service Regulations, Command and Employment of Air Power* (Washington: United States Government Printing Office, July 21, 1943), 2.

[96] Craven and Cate, *Europe: Argument to V-E Day*, 567.

sustainment.[97] First, by grouping four to five airfields together in a relatively small geographic space, each ALG within a clutch could link wired communications to one central ALG—where the wing was typically located—and that ALG could serve as the single communications hub for telephone and teletype communications to the TAC headquarters.[98]

The second reason that ALGs made sense for the highly mobile Ninth Air Force was sustainment. Before D-Day, the IX AFSC's ADGs were spread across southern England. Each ADG conducted fourth echelon maintenance on a specific type of aircraft. Once on the continent and the fighter groups began deploying across France, this made less sense. Accordingly, in October IX AFSC instituted an organizational change where it placed ADGs within a clutch of airfields to centralize fourth echelon repairs. Once the majority of an ADG's service teams moved at least seventy-five miles, the ADG would join the fighter groups and service teams within the new clutch of ALGs.[99] Additionally, clutches made IX AFSC transportation and supply depots—including POL, ammunition, ordnance, and common use supplies—more centralized. Therefore, clutches enabled the Ninth Air Force to "keep mobile" while still centralizing command and control and sustainment.[100]

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[97] Wesley Frank Craven and James Lea Cate, eds., *Plans and Early Operations, January 1939 to August 1942*, The Army Air Forces in World War II (Washington, D.C.: Office of Air Force History, 1983), 633.

[98] Jacob E. Fickel Maj. Gen. et al., *The Effectiveness of Third Phase Tactical Air Operations in the European Theater: 5 May 1944 - 8 May 1945* (Orlando Army Air Base, Florida: The Army Air Forces Evaluation Board in the European Theater of Operations, August 1945), 283, World War II Operational Documents, 1945, Combined Arms Research Library, accessed February 8, 2021, https://cgsc.contentdm.oclc.org/digital/collection/p4013coll8/id/1488; Craven and Cate, *AAF in WWII, Vol I*, 633.

[99] IX Air Force Service Command, *IX AFSC History*, 251.

[100] Craven and Cate, *Europe: Argument to V-E Day*, 135.

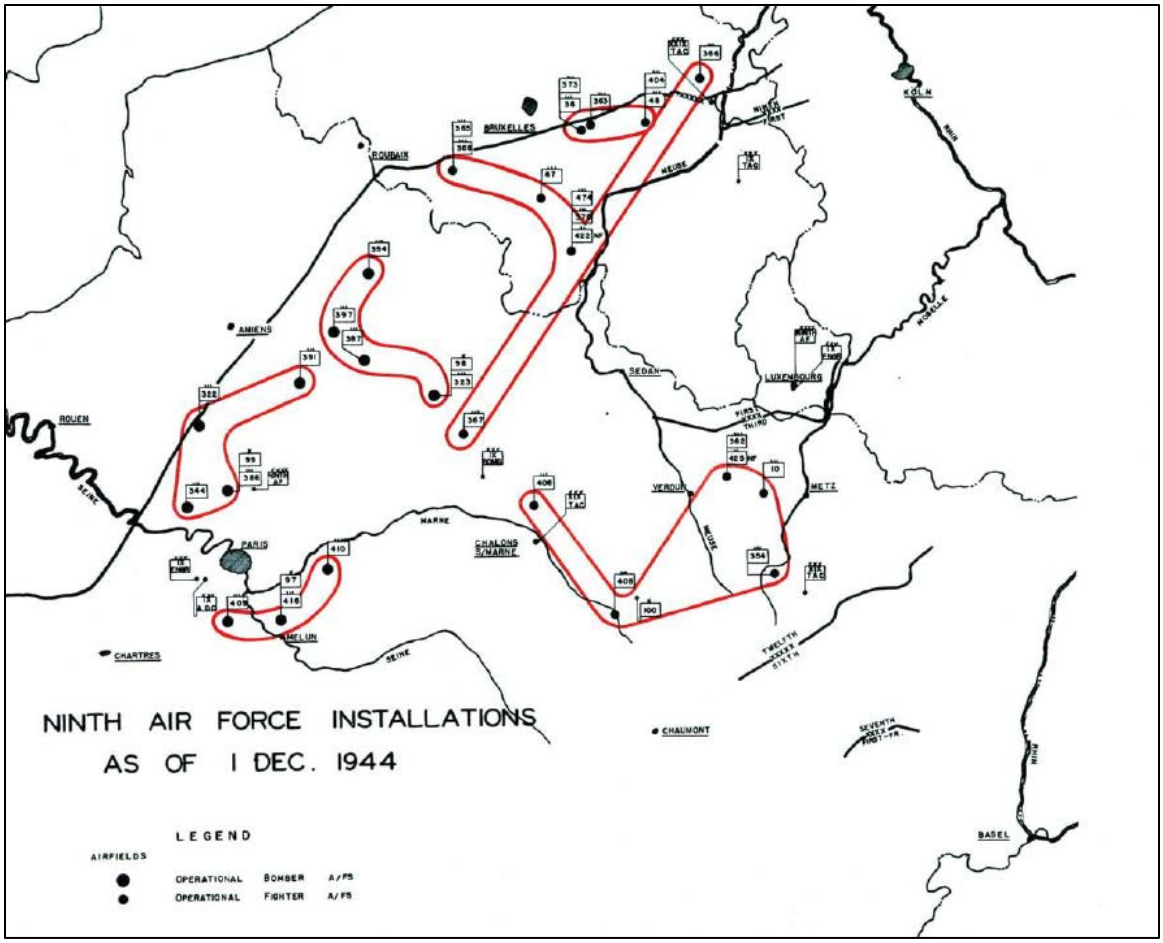

Figure 9. Example of Clutches – December 1944

Source: Jacob E. Fickel Maj. Gen. et al., *The Effectiveness of Third Phase Tactical Air Operations in the European Theater: 5 May 1944 - 8 May 1945* (Orlando Army Air Base, Florida: The Army Air Forces Evaluation Board in the European Theater of Operations, August 1945), 183.

Modern Applicability

The hub-and-spoke basing approach bears a striking resemblance to the "clutches" used by Ninth Air Force in World War II. Consequently, the Air Force could learn from the Ninth Air Force's use of clutches as they develop and refine the ACE concept in three ways. First, the hub-and-spoke basing approach could utilize a similar communications setup, albeit with modern technology. Low-density communications equipment capable of communicating beyond-line-of-sight (BLOS) to higher echelons could be centralized at the hub, while higher-density line-of-

sight (LOS) communications equipment could connect the spokes to the hub. In the event of BLOS communications denial, only the hub would need to reestablish communications via a published communications Primary-Alternate-Contingency-Emergency plan.

Second, to centralize higher echelon maintenance, the Air Force could place intermediate and some depot-level maintenance at the hub and schedule aircraft to fly from the spokes to the hub when in need of such maintenance.[101] Finally, the Air Force could centralize some supply depots at the hubs as well, given that the spokes are within a manageable driving distance, or tactical airlift is available for logistics runs between the hubs and the spokes. However, for the two preceding lessons, the risk of these measures would have to be weighed against the gain in efficiency.

Movement and Maneuver: The Roulement System

Once the aviation engineers finished work on the ALGs and airdrome squadrons set up the fuel and ammo dumps, fighter groups would typically move in within days; however, this was not always possible. The Ninth Air Force anticipated the challenge that fighter groups—due to delays in transportation or other circumstances outside of their control—might be unable to occupy ALGs as soon as they were ready. As a solution, Ninth Air Force adopted the "roulement" system.

The roulement system had fighter groups—operating from home fields well in the rear—land at forward airfields near the front lines, following their first mission of the day. They would then rearm, refuel, receive any necessary maintenance, then launch on one or more missions before returning to their home base.[102] In some cases, squadrons or fighter groups even operated

[101] Current doctrine uses the terms organizational, intermediate, and depot-level maintenance in place of World War II era doctrinal terms: first, second, third, and fourth echelon maintenance; See US Department of the Air Force, *Air Force Instruction (AFI) 21-101, Aircraft and Equipment Maintenance Management* (Washington, D.C.: Government Printing Office, January 16, 2020), 12, accessed March 25, 2021, https://static.e-publishing.af.mil/production/1/af_a4/publication/afi21-101/afi21-101.pdf.

[102] Latendresse et al., *IX Engineer Command History*, 42; Craven and Cate, *Europe: Argument to V-E Day*, 204.

on unoccupied ALGs on the roulement system for days—until the supplies from the airdrome squadron ran out—before returning to their home ALGs. This system was codified in Operation Neptune and utilized extensively starting on 13 June.[103] The first three airdrome squadrons to land in Normandy—the 9th, 64th, and 66th Airdrome Squadrons—were extremely busy. Sometimes these squadrons serviced hundreds of aircraft in one day.[104] Once all fighter groups were established at advanced airfields on the continent, the roulement system was no longer needed, at least until September 1944.

Following the St. Lô breakout, the Army moved at such a breathless pace that they quickly put the most "advanced" fields approximately 250 miles behind the front lines.[105] At a time where First and Third Army received all available transportation, fighter groups could not move up to the newly developed ALGs fast enough. Thus, the roulement system "again came into vogue," and fighter groups began to receive fuel, ammo, and additional services from the airdrome squadrons now established on ALGs east of Paris.[106]

> On Friday it started. Fairly early in the morning, someone heard the roar of four engines nearing the field. 'What do they want to make of this place, a heavy base?' When the planes set down on the strip and pulled off to a dispersal area, it turned out to be only the first of an almost continuous series of Forts, Libs, and Dakotas that came in for the next three days with loads of gas for the refueling the squadron was supposed to be doing.[107] The same day, the fighters started to come in for refuelling [sic] and re-arming --- sometimes by groups, sometimes by squadrons, sometimes by flights."[108]

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[103] Latendresse et al., *IX Engineer Command History*, 42; 9th Airdrome Squadron, "9th Airdrome Sq History, June 44," 7; Craven and Cate, *Europe: Argument to V-E Day*, 549.

[104] 83rd Airdrome Squadron, "83rd Airdrome Squadron History Installment for June 1944," July 11, 1944, 4, Reel A0516, Air Force Historical Research Agency (AFHRA).

[105] 64th Airdrome Squadron and John W. Blanford, "64th Airdrome Squadron Unit History: 1 Sept 44 to 30 Sept 44," October 10, 1944, 2, Reel A0515, Air Force Historical Research Agency (AFHRA).

[106] Craven and Cate, *Europe: Argument to V-E Day*, 270.

[107] The author of the 66th squadron history is referring to B-17 Flying Fortresses as "Forts," B-24 Liberators as "Libs," and British Commonwealth C-47 Skytrains as "Dakotas;" Boeing, "C-47 Skytrain Military Transport," *Boeing*, accessed February 15, 2021, http://www.boeing.com/history/products/c-47-skytrain.page.

[108] 66th Airdrome Squadron and Clifford N. Humphrey, "Squadron History: 66th Airdrome Squadron, September 1944," October 8, 1944, 4, A0515A, Air Force Historical Research Agency (AFHRA).

This example from the 66th Airdrome Squadron, is but one of many such examples that demonstrate how the Ninth Air Force utilized the roulement system to keep fighter groups in the fight, despite being momentarily stuck at ALGs in the rear.

Modern Applicability

The Air Force could learn from the successes of the roulement system in two ways. First, the roulement system could be a model for two different basing approaches: the FARP and the shell game basing approaches. The roulement system essentially took a complete, yet unoccupied, ALG and temporarily turned it into an R&R strip, or a FARP in the modern vernacular. Additionally, since some applications of the roulement system kept squadrons or fighter groups on the ALG for a few days before returning to their home ALG, the roulement system is also similar to the shell game basing approach. Thus, the Air Force could learn from how the airdrome squadrons set up and operated on the roulement ALGs.

Next, to sustain such a basing approach, ACE planners could take the roulement system's two key enablers—the airdrome squadron and air-delivered supplies—and combine them to create a mobile sustainment team. The airdrome squadron was a highly mobile squadron with approximately 300 personnel and equipment to provide the workforce and supplies needed to operate and supply an ALG for at least ten days. Such an organization would likely have too large of a footprint to meet the intent of the shell game basing approach in the ACE concept. However, by reducing the number of aircraft at each airfield and utilizing multi-capable airmen, the Air Force could form a smaller team with an equivalent capability. Such a team could fly to the prospective airfield on tactical airlift, secure the field, conduct an initial assessment, rapidly repair runway damage, receive follow-on supplies, unload ammunition and fuel, set up supply dumps, and be prepared to receive air forces. Subsequently, these air forces could operate on the airfield for several days until the enemy situation dictates a further move. Or, if the enemy situation permits, the airfield could continue to be expanded for more permanent operations.

Movement and Maneuver: Mines and Booby Traps

IX Engineer Command pre-invasion planners, based on experience from the African and Italian campaigns, anticipated that the German's had a significant mine and booby trap capability.[109] Before D-Day, this assumption was further corroborated as intelligence indicated that the Germans were putting this capability to work in France's potential beachhead sites.[110] Planners viewed these enemy counter-mobility operations as a challenge to the Ninth Air Force's ability to keep up with the Army's planned advance of six to ten miles per day.[111]

Once on the beaches of Normandy, engineer aviation battalions witnessed the extent of mines and booby traps first hand. In one instance, in a field near Querqueville, France (A-23), approximately 3,600 mines and booby traps of all varieties were discovered and removed.[112] Mines and booby traps, however, were not confined to the Normandy beachhead area. Following the St. Lô breakout, nearly every captured enemy airfield had some form of counter-mobility obstacles. By far, the most extensive counter-mobility effort was encountered at Strassfeld, Germany (Y-59), where the Germans left two mine belts surrounding the runway, each of which was 250-feet wide and 1000-feet long, along with over three hundred prepared demolitions dispersed over the 10,000-foot runway.[113]

By V-E Day, the IX Engineer Command had only suffered forty-three casualties from mines or booby traps due to deliberate removal operations, and "almost all resulted from accidental contact with mines or booby traps, the presence of which were unknown."[114] This low casualty rate can be attributed to one main factor, pre-invasion training. In December of 1943, the

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[109] Latendresse et al., *IX Engineer Command History*, 36.

[110] Ibid., 170.

[111] Ibid., 26.

[112] Ibid., 68.

[113] Ibid., 112, 172.

[114] Ibid., 170.

command incorporated and heavily emphasized the subject of mines and booby traps into their engineer aviation battalion training program.[115] The subject was emphasized over all subjects, and each battalion was required to clear a booby-trapped minefield at least once a week.[116] The IX Engineer Command's mine and booby trap training received so much notoriety that it held a similar course to benefit other Ninth Air Force subordinate units. Therefore, while the challenge of mines and booby traps certainly inhibited the movement and maneuver of the Ninth Air Force, its units overcame these challenges with pre-invasion training.

Modern Applicability

Today, anti-personnel landmines (APL) are highly unpopular; however, they are still a credible weapon maintained by China, Russia, and the United States.[117] To ensure that mines and booby traps do not inflict significant casualties in a future conflict, the Air Force could learn from Ninth Air Force's success by providing general mine and booby trap training to all deploying units. Additionally, the Air Force could also learn from IX Engineer Command's success with deliberate mine and booby trap removal operations by adding deliberate removal procedures to the multi-capable airmen BOS-I training syllabus and equipping these airmen for such operations.

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[115] Latendresse et al., *IX Engineer Command History*, 17.

[116] Ibid., 37.

[117] China, Russia, and the United States have not acceded to the Anti-Personnel Mine Ban Convention. China's official policy towards landmines is that "China has to reserve the right to use APLs for self-defense on its territory pending an alternative is found and its defense capability is established." Russia has made similar such statements, citing the military utility of APLs, the lack of alternatives, and financial difficulties in destroying its large stockpiles.

While exact mine production and stockpile figures are not definitively known, Chinese officials reported in 2014 that their landmine stockpiles had been reduced from a previously disputed figure of 110 million landmines to less than five million landmines. Russia, in 2004, reported their APL stockpiles at 26.5 million and has not updated their stockpile figure in subsequent reports, giving them the largest stockpile in the world.

See "Anti-Personnel Landmines (APLs)," Permanent Mission of the People's Republic of China to the United Nations Office at Geneva and Other International Organizations in Switzerland, accessed March 23, 2021, http://www.china-un.ch/eng/cj/cjjblc/cjlc/t85393.htm and "Russian Federation: Mine Ban Policy," Landmine & Cluster Munition Monitor, last modified November 20, 2020, accessed March 23, 2021, http://www.the-monitor.org/en-gb/reports/2020/russian-federation/mine-ban-policy.aspx.

Command and Control: Coordination with Supported Units

One of the inherent challenges in mobile warfare is maintaining effective coordination with supported units; the highly mobile Ninth Air Force in the ETO was no exception. Between D-Day and V-E Day, the Ninth Air Force and its subordinate units solved these coordination challenges by effectively establishing a relationship of close cooperation, co-locating headquarters, and establishing reliable communication paths.

Following the breakout, the importance of establishing a close relationship amongst Army and Air Force headquarters, at nearly every echelon, was recognized by both sides; although, this was not always the case. Before D-Day, debates over the effective use of airpower coupled with personality conflicts made Army-Air Force cooperation challenging. However, Major General Elwood "Pete" Quesada, commander of IX Fighter Command and IX Tactical Air Command, worked tirelessly to improve Army-Air Force cooperation and relationships with senior commanders before D-Day. His efforts were highly successful, particularly with Lieutenant General Omar Bradley, commander of the organization that General Quesada's IX TAC would support for the remainder of the war, First Army.

In August 1944—with the activation of Third Army, XIX Tactical Air Command, and 12th Army Group—the effective liaison that Quesada, Bradley, and their staffs built before and after D-Day was modeled in the new commands (see Figure 10, below).

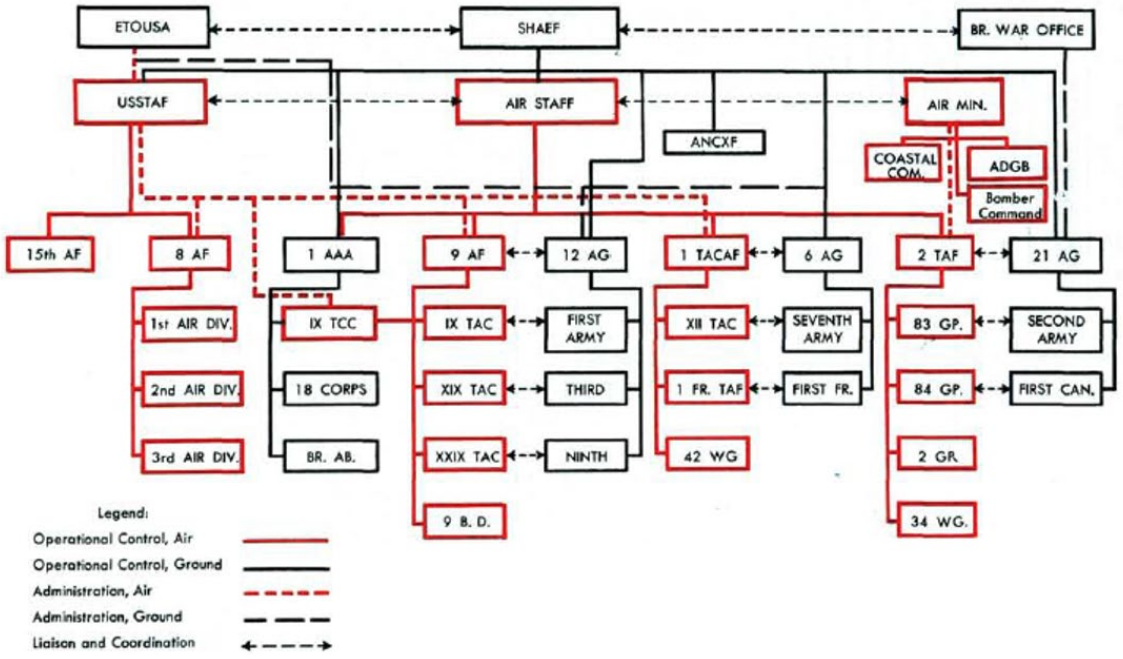

Figure 10. Basic Command and Control, SHAEF

Source: Jacob E. Fickel Maj. Gen. et al., *The Effectiveness of Third Phase Tactical Air Operations in the European Theater: 5 May 1944 - 8 May 1945* (Orlando Army Air Base, Florida: The Army Air Forces Evaluation Board in the European Theater of Operations, August 1945), 271.

Ninth Air Force and its staff were aligned with the 12th Army Group, commanded by First Army's former commander, General Bradley. In this new supporting-supported relationship, Ninth Air Force recognized that "the operations controlled by Ninth Air Force Headquarters [should] be developed in the closest association with Headquarters Twelfth Army Group…"[118] So, on 6 August 1944, they moved their England-based main headquarters and their French-based advanced headquarters to the same location, adjacent to the 12th Army Group advanced headquarters at St. Sauveur Lendelin.[119]

[118] Robert H. George Lt. Col. and AAF Historical Office, *Ninth Air Force: April to November 1944*, Army Air Forces Historical Studies, October 1945, 162, accessed February 9, 2021, https://www.afhra.af.mil/Portals/16/documents/Studies/1-50/AFD-090602-084.pdf.

[119] George and AAF Historical Office, *Ninth Air Force: April to November 1944*, 162.

At the new headquarters, Ninth Air Force adopted a model—quite similar to the one already in place between IX TAC and First Army—where the 12th Army Group G-2 (Air) and G-3 (Air) would physically move to the operations center in the Ninth Air Force headquarters. In the operations center, "briefings twice a day saw Army depict the ground situation and air relate the results of its recent efforts. Ground then presented its requests and with air arrived at an allocation of available strength and a determination of the air plan."[120] One benefit of combining the planning staffs at this level was that the plans—taking full account of all existing ground and air information—could be "devised in a fashion which allowed an ample exercise of initiative by the associated TACs and armies."[121] To keep this relationship strong, Ninth Air Force continually strove to locate at least an advanced headquarters with 12th Army Group. However, as appropriately stated by Craven and Cate, "such moves…were as nothing compared to the enforced mobility of the TACs."[122]

With the Army command structure change, IX TAC continued its close relationship with First Army, albeit with a new Army commander in Lieutenant General Courtney Hodges.[123] Additional TAC-Army relationships were formed with XIX TAC and Third Army's activation in August 1944 and XXIX TAC and Ninth Army in September 1944.[124] In all three cases, the TAC Combat Operations Section—comprised of the non-administrative functions within the A-2 and A-3—worked in close cooperation with Field Army G-2 (Air) and G-3 (Air), who were physically located in this section. Some TAC's referred to this arrangement as the "Combined Operations Center," or just "Combat Ops."[125] The combined operations center was responsible

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[120] Craven and Cate, *Europe: Argument to V-E Day*, 244.

[121] Ibid.

[122] Ibid., 268.

[123] Martin Blumenson, *Breakout and Pursuit*, The European Theater of Operations (Washington, D.C.: Center of Military History, United States Army, 1961), 344.

[124] Ibid., 344, 637; Craven and Cate, *Europe: Argument to V-E Day*, 597.

[125] Fickel et al., *Third Phase Air Operations*, 283.

for turning long-range plans into actionable operations orders, taking into account requests for planned air support missions from the lower echelon army units. This request process is shown below in Figure 11.

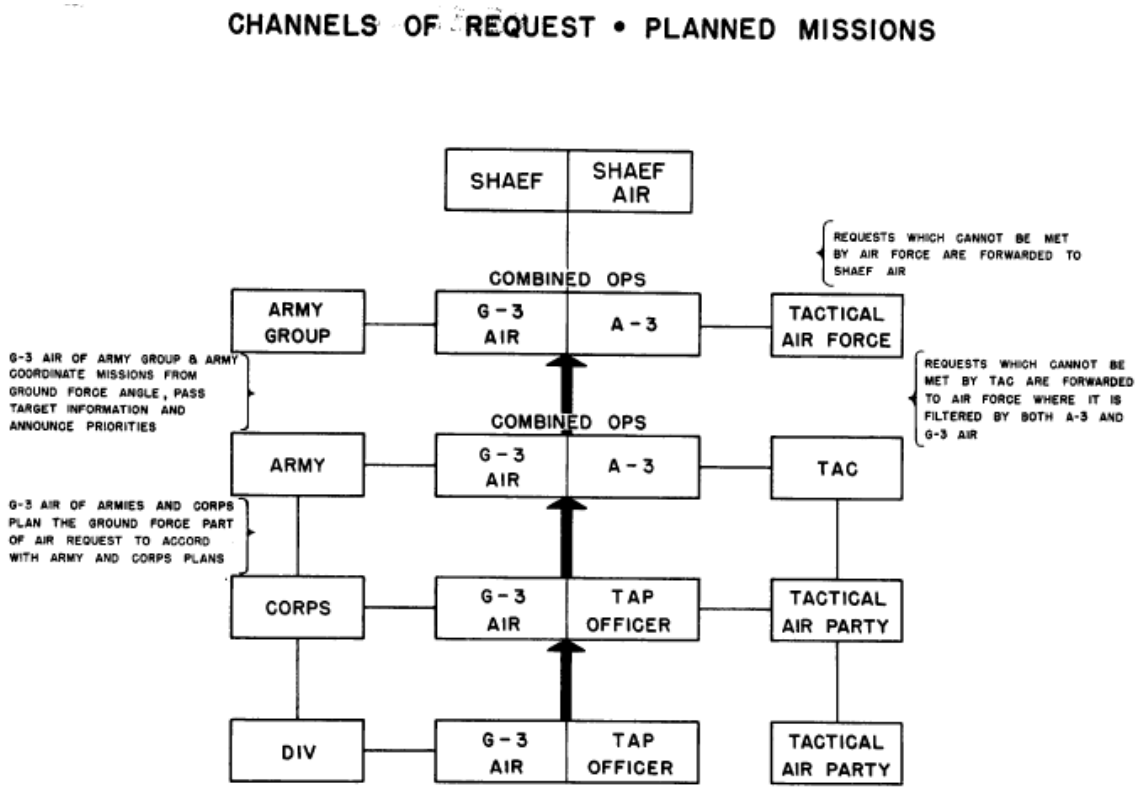

Figure 11. Channels of Request – Planned Missions

Source: Jacob E. Fickel Maj. Gen. et al., *The Effectiveness of Third Phase Tactical Air Operations in the European Theater: 5 May 1944 - 8 May 1945* (Orlando Army Air Base, Florida: The Army Air Forces Evaluation Board in the European Theater of Operations, August 1945), 281.

The combined operations center also planned the day-to-day operations, including "fixing…the current bomb line, selection of special targets, preparation of reconnaissance plans and the appropriate allocation of the available resources."[126] The combined operations center also

[126] Fickel et al., *Third Phase Air Operations*, 283.

handled immediate air support requests submitted directly from the division or corps via air force channels. This process is shown below in Figure 12.

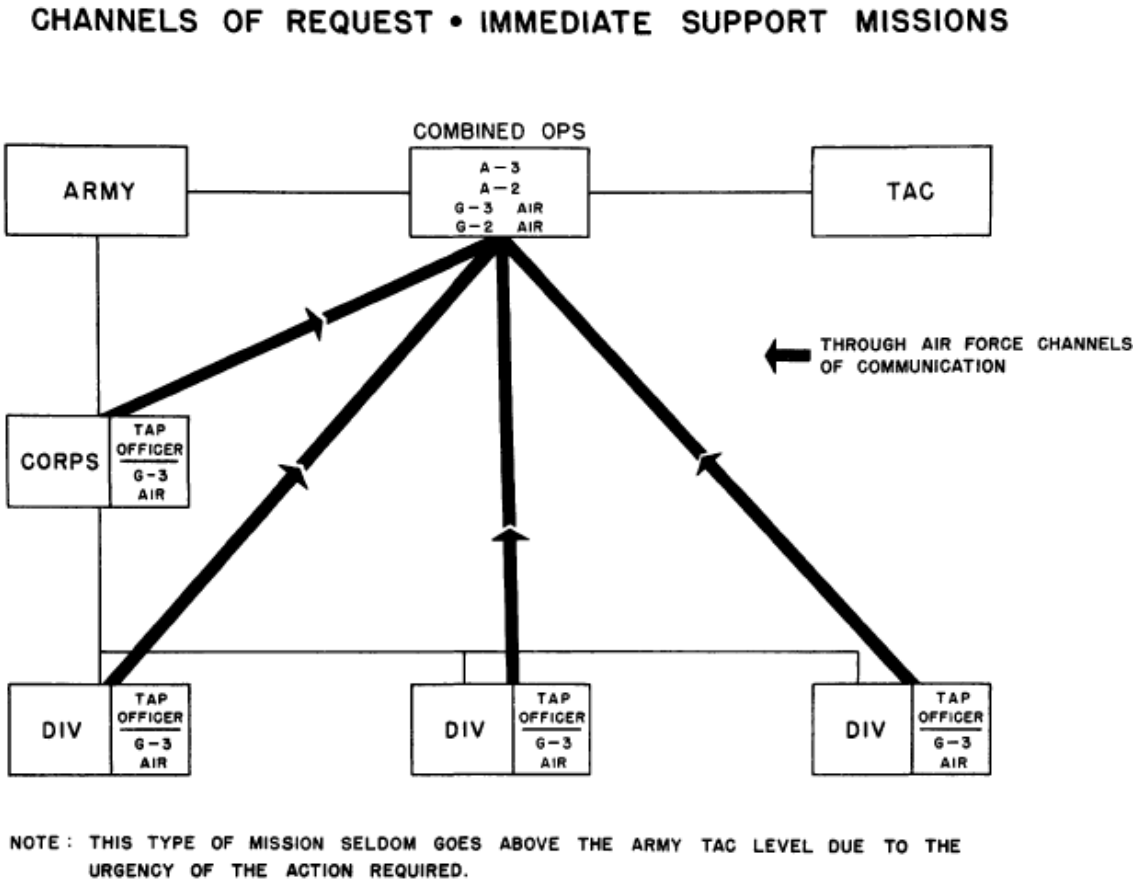

Figure 12. Channels of Request – Immediate Support Missions

Source: Jacob E. Fickel Maj. Gen. et al., *The Effectiveness of Third Phase Tactical Air Operations in the European Theater: 5 May 1944 - 8 May 1945* (Orlando Army Air Base, Florida: The Army Air Forces Evaluation Board in the European Theater of Operations, August 1945), 282.

Another factor contributing to effective coordination at the TAC-Army level was the TAC headquarters' physical location. As a general rule, all three TACs strove to move their headquarters alongside their aligned field army. As to be expected, this was easier in some phases and more challenging in others. With First and Ninth Army moving relatively slowly—when compared to Third Army—IX and XXIX TAC typically consolidated their rear and advanced

headquarters during periods of little movement. When a move was required, the advanced TAC headquarters would move alongside the Army and set up a duplicate combined operations center at the new Army headquarters. Once communications were established, the advanced headquarters would take over operations, and the rear headquarters would incrementally move to the new site. These command relationships, during mobile operations and static operations, are depicted below in Figure 13.[127]

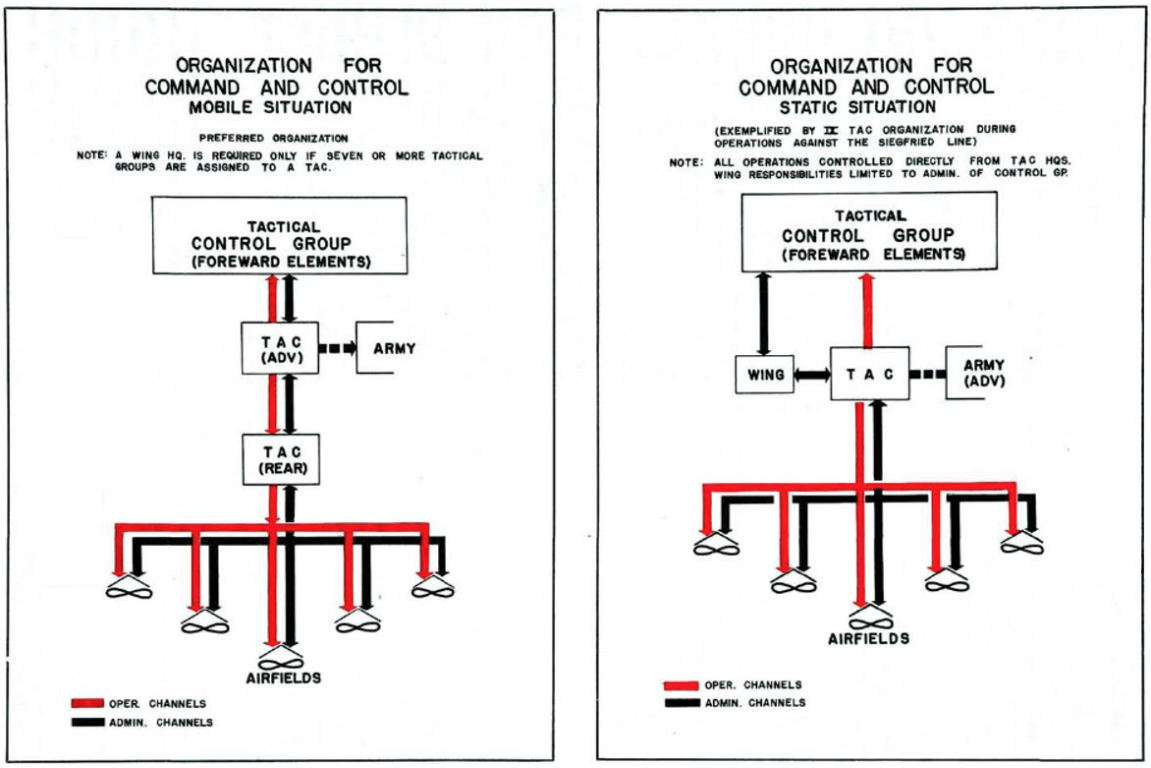

Figure 13. IX and XXIX TAC Command and Control – Mobile and Static

Source: Jacob E. Fickel Maj. Gen. et al., *The Effectiveness of Third Phase Tactical Air Operations in the European Theater: 5 May 1944 - 8 May 1945* (Orlando Army Air Base, Florida: The Army Air Forces Evaluation Board in the European Theater of Operations, August 1945), 284.

Due to the much more mobile Third Army, XIX TAC had to modify this command and control structure by adding a third headquarters, "X-Ray," a small detachment of key operations and

[127] Fickel et al., *Third Phase Air Operations*, 283.

signal personnel.[128] Their job was to move with the Third Army's advanced headquarters, establish communications back to the advanced headquarters of XIX TAC, and determine air requirements based on the ground situation and Lieutenant General Patton's plan. Combat Ops, as the combined ops center was known in XIX TAC, was located in the TAC advanced headquarters. This echelon moved at the speed at which signal personnel could establish "good telephone and teletype communication to wing headquarters, in the airfield area."[129] This modified command and control structure can be seen below in Figure 14.

Similar to that of the Ninth Air Force-12th Army Group and TAC-Army echelons, the relationship of close cooperation spread to the Wing-Corps and Group-Division echelons. This close cooperation at the lower echelons was made possible by the Tactical Air Party Officers (TAPO) and the Ground Liaison Officers (GLO). The TAPOs were rated pilots that had typically completed their combat tour in a fighter group. These officers were assigned to either a corps, division, or combat command headquarters for a ninety-day tour with a two-week overlap to ensure an effective duty handover.[130] The TAPO's primary job was to advise the commander on matters involving air support, review air targets nominated by the G-3 (Air), and transmit requests for air support up the air force channels to the TAC headquarters (see Figure 11 and Figure 12, above).[131] To complete the exchange, the Army would provide a GLO to every air force echelon

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[128] Fickel et al., *Third Phase Air Operations*, 283; XIX Tactical Air Command, *Tactical Air Operations in Europe: A Report on Employment of Fighter-Bomber, Reconnaissance and Night Fighter Aircraft by XIX Tactical Air Command, Ninth Air Force, in Connection with the Third US Army Campaign from 1 August 1944 to VE Day, 9 May 1945*, May 19, 1945, 17.

[129] Fickel et al., *Third Phase Air Operations*, 283.

[130] Ibid., 286.

[131] TAPOs—originally envisaged to build cooperation between air force and army headquarters—took on a more tactical air to ground coordination role in the leadup to the St. Lô breakout and throughout the war. These officers—augmented with an additional four combat experienced pilots on a 2-week rotation—would act as a forward controller from the lead tanks in the armored thrust. Twelve tanks per division were equipped with SCR-522 VHF radios so that these forward controllers could speak directly with the pilots and direct the Thunderbolts assigned to "armored column cover" missions towards their targets. This tactic of air to ground coordination was pioneered by General Quesada and the IX TAC and was eventually adopted by all of Ninth Air Force; Hughes, *Over Lord*, 183–184; Fickel et al., *Third Phase Air Operations*, 286.

down to the squadron level. These officers would keep pilots informed on the ground situation by keeping in close contact with the G-3 (Air) within the combined operations center in the TAC headquarters. Likewise, the GLO passed along information from the pilots following their missions—results, ground claims, updated location of the friendlies and the enemy—to the G-3 (Air).[132] Thus, from the GLO at the squadron, all the way up to the G-2 and G-3 (Air) in the Ninth Air Force operations center, the air force and the army maintained a relationship of close cooperation.[133]

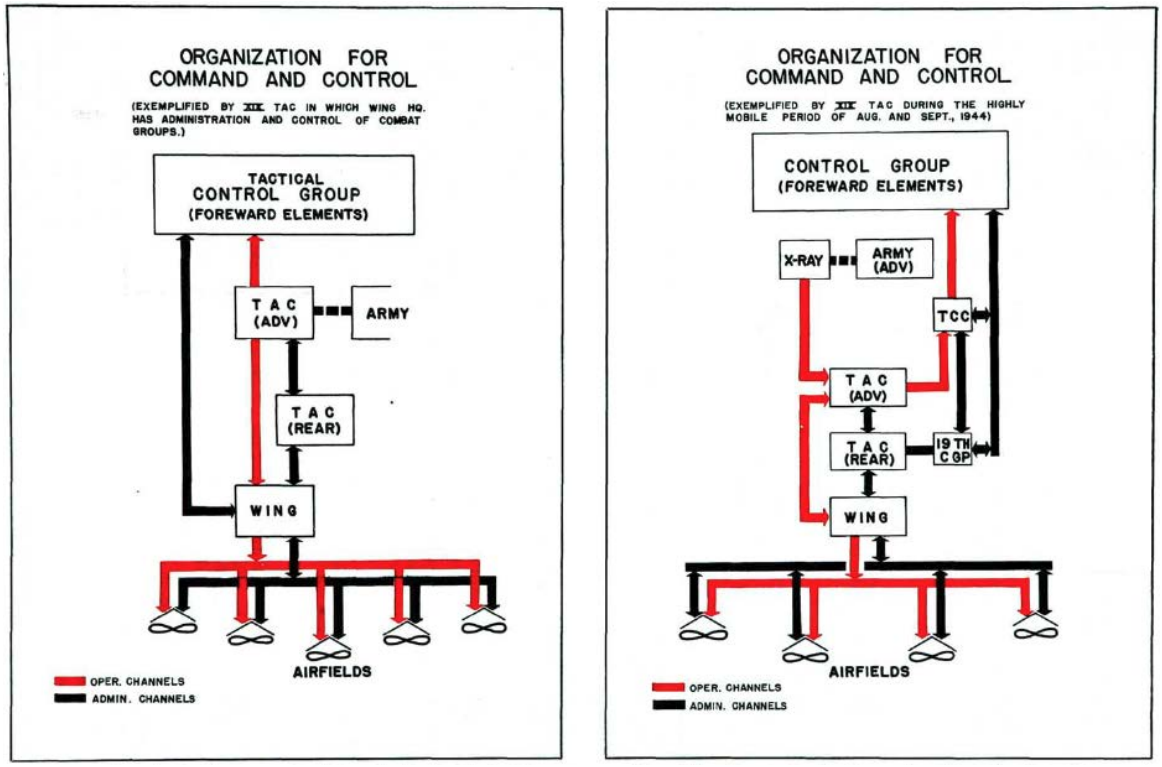

Figure 14. XIX TAC Command and Control – Mobile and Highly Mobile

Source: Jacob E. Fickel Maj. Gen. et al., *The Effectiveness of Third Phase Tactical Air Operations in the European Theater: 5 May 1944 - 8 May 1945* (Orlando Army Air Base, Florida: The Army Air Forces Evaluation Board in the European Theater of Operations, August 1945), 285.

[132] Fickel et al., *Third Phase Air Operations*, 286.

[133] Ibid.

Finally, coordination between organizations and C2 within organizations was enabled by effective communications up and down the different echelons of command, albeit despite several challenges. One challenge experienced by many organizations was that the rate of building communications pathways could not keep up with the ground tempo. In one example, XIX TAC, attempting to move with Third Army at the rate of twenty miles per day, moved forward in advance of its landlines, which resulted in poor communications and unsatisfactory operations. The XIX TAC commander, General Otto P. Weyland, decreed that never again would his XIX TAC advance ahead of adequate landline communications.[134]

To prevent situations like these, IX TAC created a "flying column," and XIX TAC created TAC X-Ray, mentioned above, to keep pace with First and Third Army's advanced headquarters, respectively.[135] These forward echelons of command stayed connected to their advanced headquarters "through a sometimes odd assortment of communications links."[136] Additionally, Ninth Air Force and TAC headquarters kept two sets of operations equipment on hand, one at the main headquarters and one at the advanced headquarters. This ensured continuity of operations during a planned headquarters move, during an isolated communications outage, or in the case where an advanced headquarters was overrun by the enemy (which never happened).[137] In an additional safeguard against disrupted communications between the TACs and the wings, the former ensured that the latter had the most complete and up-to-date information available to enable autonomous operations if required.[138]

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[134] XIX Tactical Air Command, *Tactical Air Operations in Europe*, 17.

[135] George and AAF Historical Office, *Ninth Air Force: Apr - Nov 44*, 163.

[136] Craven and Cate, *Europe: Argument to V-E Day*, 268.

[137] Richard H. Kohn and Joseph P. Harahan, eds., *Condensed Analysis of the Ninth Air Force in the European Theater of Operations*, USAF warrior studies (Washington, D.C: Office of Air Force History, United States Air Force, 1984), 114.

[138] Craven and Cate, *Europe: Argument to V-E Day*, 268.

Modern Applicability

C2 is one of the most significant challenges to ACE that has yet to be fully solved. In addition to the capability to place the large airbase model at risk, China and Russia also have the capability to challenge the communications links laterally amongst ACE's small airfields and vertically up to higher echelons of command, such as the Air Operations Center (AOC). These two adversary capabilities significantly challenge a commander's ability to C2 his forces—at all echelons—and adhere to certain principles of war, such as unity of effort and unity of command, or the primary tenet of airpower, centralized control and decentralized execution. The Ninth Air Force's experiences with C2 in World War II offer some lessons that ACE planners should consider.

First, the Air Force could learn from the Ninth Air Force-TAC deliberate communications that built a shared understanding to enable autonomous TAC operations in the event of communications outages. In current doctrine, the Air Force calls on forward expeditionary wings or task forces to perform similar autonomous operations "even when disconnected from communications with higher headquarters due to a contested environment against a peer or near-peer adversary."[139] However, unlike the TAC commanders, current wing commanders are not organized with an appropriately sized staff, trained, or equipped to plan such operations.[140] Therefore, to enable wing commanders to meet the intent of doctrine and continue operations in a contested or degraded operational environment, the Air Force should organize, train, and equip prospective expeditionary wings for independent planning.

Second, the Air Force could learn from the TACs maintaining two sets of operations equipment to mitigate disruptions in C2 during HQ moves, communications outages, or in the

[139] US Department of the Air Force, *Air Force Doctrine Publication (AFDP) 3-30, Command and Control* (Maxwell AFB, AL: LeMay Center for Doctrine, January 7, 2020), 3, accessed March 24, 2021, https://www.doctrine.af.mil/Portals/61/documents/AFDP_3-30/AFDP%203-30-Command-and-Control.pdf.

[140] Colonel Michael R. Drowley, interview by author, April 22, 2020.

case that the enemy overran an HQ location. Assuming the Air Force uses the hub-and-spoke basing approach, expeditionary wing commanders could place the first set of operations equipment at the hub and a second set at one of the spokes. This would provide the wing headquarters a flush location at one of the spokes without the time requirement and cargo capacity required to pack up and haul operations equipment to the flush location. Additionally, this would give the wing commander a forward headquarters location that is already set up, should he choose to move closer to the front lines.

The third C2 lesson that the Air Force could learn from relates to coordination with supported units. While there are significant differences in how support sorties were assigned to the Army in World War II and how close air support sorties are apportioned today, ACE planners can still learn from the lesson of close cooperation between the Ninth Air Force and 12th Army Group. Today, the relationship of close cooperation at the operational level is made possible through the Battlefield Coordination Detachment (BCD) located inside the AOC. The BCD performs tasks to include "facilitating the exchange of current intelligence and operational data, processing [air support requests], monitoring and interpreting the land battle situation…and integrating airspace requirements."[141] At the tactical level, close cooperation is made possible by the Ground Liaison Detachment (GLD)—typically comprised of one GLO and one fire support sergeant—assigned to wings and squadrons. The GLO is "responsible for the liaison functions of monitoring, coordinating, advising, and assisting USAF personnel on Army operations."[142]

Assuming that AOC communications are cut off from lower echelons of command, and expeditionary wings are operating off mission-type orders and conditions-based authorities, the BCD—located inside the AOC—would be cut off as well.[143] Thus, the roles and responsibilities

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[141] Chairman of the Joint Chiefs of Staff, *Joint Publication 3-30: Joint Air Operations* (Washington, D.C.: Office of the Chairman of the Joint Chiefs of Staff, July 25, 2019), F-1.

[142] US Department of the Army, *Army Tactics, Techniques, and Procedures (ATTP) 3-09.13, The Battlefield Coordination Detachment* (Washington, D.C.: Government Printing Office, July 2015), 2–17.

[143] US Department of the Air Force, *AFDP 3-30*, 1–2.

of the BCD would be left to the wing-assigned GLD, which is neither manned, trained, or equipped for such contingencies. Therefore, the Air Force and Army should consider evaluating GLD manning, training, and equipping, considering the increased responsibilities that GLDs will incur given that the AOC and BCD are cut off from lower echelon units.

Sustainment: Locally Procured Raw Construction Materials

As the Allies began the pursuit phase following the St. Lô breakout, a lack of raw construction materials—namely gravel, rock, cement, asphalt, and tar—were in short supply, caused by an increased demand signal due to several factors. Due to Allied bomb and German demolition damage, the first of these factors was extensive repairs on a greater than planned number of captured enemy hard-surfaced airfields. Additionally, depending on the airfield's existing configuration, many sites required either runway, taxi-track, or hardstand expansion.[144] Finally, until the Fall weather arrived, the foundation underneath surfacing materials for virgin sites was merely compacted earth.[145] Once the Fall rains began, runways, taxi tracks, hardstands, and service roads required a firmer foundation made of gravel. Accordingly, each of these three factors led to a shortage of raw construction materials.

To solve these challenges, IX EC initially requisitioned these materials from Army supply; however, the weight of these raw construction materials combined with the aforementioned supply and transportation problems made this supply source less than ideal.[146] In its place, IX EC turned to local sources. Local quarries were a prime source for rock, which could be crushed to varying sizes for asphalt and concrete aggregate or gravel. Some quarries even had stocks of cinder blocks, gravel, and slag on hand, which were utilized extensively.[147] Local asphalt plants were a prime source for hot asphalt cement; although, these plants were often

[144] Latendresse et al., *IX Engineer Command History*, 154.

[145] Ibid., 155.

[146] Ibid., 96.

[147] Ibid., 155.

inoperative. Consequently, aviation engineers often spent the time to help the local civilians repair these facilities and make them operational.[148]

Since the local quarries and asphalt plants were highly sought after, extensive ground and air reconnaissance were employed to locate these critical sources of raw construction materials within ten miles of a prospective site. However, this was not always possible, and aviation engineers required more innovative sources for these critical supplies. In many cases, battalions would procure rubble from the wreckage of nearby "war-ravaged towns and villages."[149] They then used their rock crushers to break down the rubble to a suitable size for foundations throughout an ALG or aggregate for cement and asphalt.[150]

Modern Applicability

Today, the Air Force could learn from this lesson by cataloging sources of local raw materials—such as quarries, cement and asphalt plants, lumber yards, agricultural sources, and water sources—in potential operating locations. This would allow planners to select prospective airfields with the knowledge of what local raw materials were nearby, enabling a more efficient plan for which supplies need to be flown in and which supplies planners could expect multi-capable airmen to procure locally.

Sustainment: Aviation Gasoline Distribution

As discussed in the previous chapter, the continent's Avgas supply plans were extensive; however, several significant challenges emerged in execution. In the first few weeks of the invasion, the plan called for the Ninth Air Force to be supplied Avgas packaged in jerry cans until the minor system began distributing bulk Avgas on D+15.[151] With the Allies confined to Normandy and a lower-than-expected flying rate, the Allies were able to stockpile approximately

[148] Latendresse et al., *IX Engineer Command History*, 96.

[149] Ibid., 155.

[150] Ibid., 96, 155.

[151] Craven and Cate, *Europe: Argument to V-E Day*, 133, 583.

a ten-day supply of packaged Avgas by June 20th.[152] A few days later, however, the challenges began when bulk Avgas service came to the continent, of which the most significant challenge was distribution.

Several factors after the St. Lô breakout contributed to the Avgas distribution challenge on the continent. First, nearly all airfields completed the transition from packaged Avgas to bulk Avgas by 23 July.[153] To transport such fuel from the pipeline terminus to either an advance dump or direct to an ALG required specialized fuel trucks that were in short supply. Next, in August, the fighter groups began their trek across Europe, moving from Normandy to newly constructed ALGs near Le Mans-Chartres and continually until the end of the war, at which time most fighter groups had moved seven times. These moves repeatedly stretched the Ninth Air Force Avgas supply lines—between the ports, pipeline termini, railheads, advance dumps, and ALGs—which the pipeline construction rate could not keep up with.[154]

Finally, adding to these challenges was the Army's impact on available transportation. The Army's rapid advance stretched their supply lines as well, which meant that COMZ had to prioritize all forms of transportation—trucks and rail—to the First and Third Army. While COMZ was contracted to transport Avgas and supplies from the ports or pipeline terminus to an advance dump within forty miles of the user, the trucks and rail cars were now mostly unavailable, and COMZ often did not meet the forty-mile obligation.[155] To make matters worse, even with the COMZ priority, the Army still did not have enough transportation capacity. Thus, to prevent the First and Third Army from culminating during the pursuit phase, COMZ assimilated a portion of the IX AFSC owned QM truck companies into its service in August and September.[156]

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[152] Craven and Cate, *Europe: Argument to V-E Day*, 583–584.

[153] Ibid., 584.

[154] Ibid., 133, 584.

[155] Ibid., 578.

[156] Ibid., 556.

With all these factors affecting Avgas distribution, the burden of preventing Ninth Air Force from culminating fell squarely on IX AFSC, which utilized both truck and air transportation. For truck transportation, IX AFSC repurposed what remained of the QM Truck Groups and trucks from the service teams and fighter groups. Now, rather than hauling Avgas from an advance dump to an ALG forty miles away, the QM Truck Groups were filling in for COMZ and transporting the Avgas from either the port, pipeline terminus, or railhead to the advance dump.[157] Between July and September, these groups hauled over 17,000,000 gallons of gasoline over a distance of 6,000,000 miles to combat units in the Ninth Air Force.[158] The longest roundtrip distance logged by a QM truck company occurred in September and was 850 miles.[159]

In addition, the organic transportation of the service teams and the fighter groups now transported Avgas and other supplies from the advance dumps to the ALGs, a job previously accomplished by the QM truck groups.[160] With the fighter group's continual advancement to closer ALGs, these advance dumps were sometimes as far away as 150 miles from the ALG to be supplied.[161] It cannot be overstated that the QM truck groups, nor the organic transportation of the service teams and fighter groups, were either manned, equipped, or maintained for such a job.

To further relieve the strain in Avgas distribution, particularly at the most advanced ALGs, IX AFSC began employing large numbers of air transportation in September to distribute packaged Avgas.[162] IX AFSC utilized the three previously mentioned air transport groups and

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[157] Craven and Cate, *Europe: Argument to V-E Day*, *556*; The IX AFSC QM truck battalions hauled 1,461,700 gallons of Avgas in July. Once COMZ focused the preponderance of their transportation towards First and Third Army the amount of Avgas transported by IX AFSC rose dramatically. For comparison, in September they hauled 7,750,000 gallons, in December nearly 10,000,000 gallons, and in April 1945 over 19,000,000 gallons.

[158] IX Air Force Service Command, *IX AFSC History*, 242.

[159] Craven and Cate, *Europe: Argument to V-E Day*, 585.

[160] Ibid., 556.

[161] IX Air Force Service Command, *IX AFSC History*, 242–243.

[162] Ibid., 243–244; Craven and Cate, *Europe: Argument to V-E Day*, 584.

sparingly utilized specially loaded bombers, with a 1,500-gallon Avgas load capacity, from the Eighth Air Force.[163]

Modern Applicability

Following the war, IX AFSC recommended that the Air Force be given complete responsibility for aviation fuel and be given adequate resources to accomplish that responsibility in future conflicts.[164] Today, contingency sustainment plans for any theater are classified, so there is no way to tell if POL or other critical supply distribution plans rely on other services or nations. As an indicator, PACAF's sustainment line of effort for the ACE concept mentions that planners must consider sustainment capabilities offered by joint, allied, and host nation resource providers.[165] This statement implies a critical supply distribution plan that balances Air Force, joint, allied, and host nation resource providers. However, if an existing plan relies on another military service or partner nation as the sole source of critical supply, the Air Force should remember the lesson of the Ninth Air Force's reliance on COMZ for Avgas distribution and consider establishing secondary and tertiary sources of critical supply.

Protection: Camouflage, Concealment, and Deception

Prior to D-Day, the Luftwaffe demonstrated their ability to accurately bomb targets from the air in several operations. While the German aircraft industry was one of the six main "systems" that the Combined Bomber Offensive targeted, the Allies still expected to be threatened by the Luftwaffe in Operation Overlord and had to take steps to mitigate the threat.[166] Thus, the Allies were presented with the challenge of passively defending against such an air threat. As a solution, the Allies turned primarily to camouflage, concealment, and deception (CC&D).

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[163] IX Air Force Service Command, *IX AFSC History*, 243.

[164] IX Air Force Service Command, *Functional History of IX AFSC (Draft)*, chap. XI p. 1.

[165] United States Pacific Air Forces, "PACAF ACE Annex," 8.

[166] US Department of State, *CCS 217, 14 May 1943*, 9.

In planning for D-Day, IX Engineer Command was given the responsibility in Operation Neptune to "[furnish] technical assistance on general camouflage work, [inspect] camouflage security measures, and [execute] special camouflage projects for the Ninth Air Force." To fulfill this responsibility, IX EC turned to its dedicated engineer aviation camouflage battalion—the 937th—whose work with camouflage came primarily in the invasion's opening phase. As the war in Europe progressed and the Allies began to enjoy air superiority, the 937th was progressively assigned to fewer camouflage jobs.

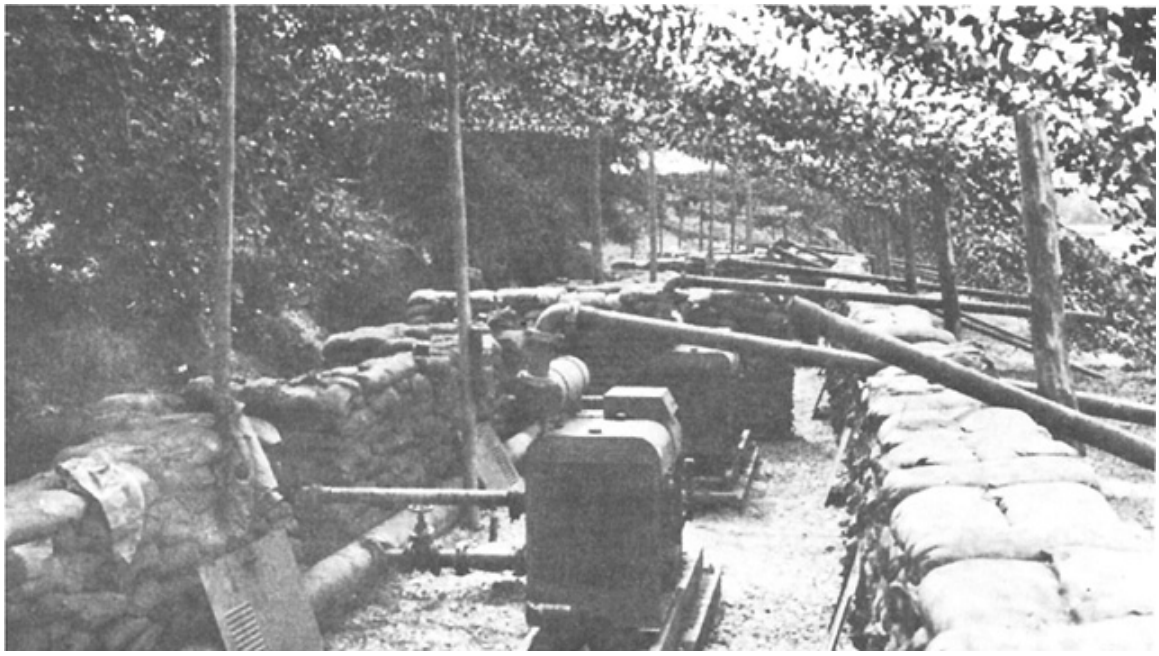

Figure 15. Camouflaged Pumping Station

Source: Roland G. Ruppenthal, *Logistical Support of the Armies: Volume II: September 1944 - May 1945*, United States Army in World War II: The European Theater of Operations (Washington, DC: Center of Military History, 1959), 197.

The Ninth Air Force also utilized deception operations as part of their passive defense. During their training in England, the 937th practiced building decoy aircraft on newly constructed ALGs in southern England. Along with others built on the continent, these decoy aircraft were

used to deceive would-be Luftwaffe air attacks throughout continental Europe.[167] The 937th even maintained these decoy aircraft to keep up their appearance and believability.[168] Another method of deception was decoy airfields. These mock airfields came in two varieties, day decoy airfields, designated "K" sites, and night decoy airfields, designated "Q" sites. The "Q" sites were, by far, used more extensively than the "K" sites. "Q" Sites utilized specialized lights arrayed in particular patterns that made an empty field appear to be a fully functioning airfield to German night raids. By the end of July, the men of the 937th had emplaced three such "Q" sites, which were immediately effective. For example, "on July 29 the enemy dropped what were estimated to be two five hundred kilo bombs on the site AZ-4, south of the highway at Longueville, making craters sixty feet wide and thirty five feet deep."[169] Therefore, camouflage, dispersal, and deception operations were a proactive solution to the Luftwaffe, which ended up being less of a challenge than initially anticipated.

Modern Applicability

The 937th and the rest of the Ninth Air Force's experiences with camouflage, concealment, and deception offer several lessons that could be valuable to the Air Force; this subsection will offer two such lessons. First, in a future conflict with nations such as Russia and China, the US Air Force will not have theater-wide air superiority, as it has for decades. While active measures, such as combat air patrols or ground-based air defenses, will provide a layer of defense against enemy air attacks, passive defensive measures should be considered as well. Therefore, the Air Force could learn from Ninth Air Force's camouflage training by adding CC&D training to mission generation and BOS-I multi-capable airmen training syllabi. Such

[167] Latendresse et al., *IX Engineer Command History*, 36.

[168] 937th Engineer Aviation Camouflage Battalion and Marvin Gordon, "937th Engineer Aviation Camouflage Battalion, 1 April to 30 April 1945," May 15, 1945, 1–2, Reel C5008, Air Force Historical Research Agency (AFHRA).

[169] 937th Engineer Aviation Camouflage Battalion and Marvin Gordon, "937th Engineer Aviation Camouflage Battalion, 1 July to 31 July 1944," August 7, 1944, 4, Reel A0276, Air Force Historical Research Agency (AFHRA).

efforts would establish a cadre of CC&D-minded airmen capable of complicating enemy targeting, increasing survivability.

The second lesson from the Ninth Air Force's use of CC&D comes in decoy airfields. The Air Force of 2021 could learn from their use of decoy airfields but in a more modern way. During the 2019 Air Force Associations Air, Space, & Cyber Conference, the PACAF commander, General Charles Q. Brown Jr., spoke about operating from multiple bases as part of the Agile Combat Employment concept. He said, "the more locations I have out there, the more locations the adversary has to think about."[170] One way that General Brown can have more locations is through decoy airfields, described best through a short example.

Suppose that through recent United States military action, thirty civilian airfields—half in a recently liberated country and half on the outskirts of the enemy nation—are now available for the Air Force to stage from. Over a few days, the Air Force demonstrates and exercises the capability to move in, operate from, and rapidly depart from three of these airfields, all in plain sight of the enemy's long-range ISR. Concurrently with these operations, tactical sorties returning from the front lines, along with airlift sorties, periodically make mock approaches into all thirty airfields. Finally, the Air Force conducts an information operations campaign that sends a unified message that the Air Force has recently expanded their operational reach and survivability by taking over thirty new airfields. These collective actions effectively create thirty decoy airfields. Such an approach would add confusion to the enemy, force the enemy to allocate resources—either ISR or kinetic weapons—to each of these airfields, and increase survivability.

Chapter Conclusion

The Ninth Air Force faced several challenges during their contribution to the Wehrmacht's unconditional surrender, only a few of which are addressed in this chapter. The

[170] General Charles Q. Brown Jr., "PACAF's Brown on China, Distributed Operations, Innovative Warfighting Concepts, Air Defense," interview by Vago Muradian, September 2019, accessed April 27, 2020, https://www.youtube.com/watch?v=a22yE3cQj3M.

solutions to some of these challenges were already identified in planning, such as training on mines and booby traps or procedures and plans for the roulement system. Most of the challenges, however, were unidentified in planning, and their solutions were reactionary. So, if there is one overall lesson that can be gleaned from the Ninth Air Force building, rehabilitating, supplying, and operating on 241 airfields in the ETO, it is that the Air Force must be ready to adapt to unforeseen challenges. The US military has shown its ability to adapt and innovate solutions to *unforeseen* challenges throughout its 245 years of existence. However, the Air Force should learn from the successes and failures of the Ninth Air Force in the ETO and save their adaptive and innovative skills for the unforeseen challenges that modern adversaries are bound to impose upon the United States.

Chapter Five

Recommendations and Conclusions

> …the next fight, the one we must prepare for as laid out in the National Defense Strategy, may not have fixed bases, infrastructure, and established command and control, with leaders already forward, ready to receive follow-on forces. *So, it is time to return to our expeditionary roots* [emphasis added].
>
> —General David L. Goldfein, *2018 Air, Space, and Cyberspace Conference Keynote Address*

General David L. Goldfein, in this chapter's epigraph, is referencing 1998 and the Air Force's Expeditionary Air Force (EAF) concept. While the EAF concept is undoubtedly part of the Air Force's expeditionary past, the Ninth Air Force in the ETO was arguably the most expeditionary force in the Air Force's lineage. The experiences and lessons they accumulated, which were paid for in blood, should not be forgotten. Some might dismiss the Ninth Air Force's experiences in the ETO as a thing of the past and not relevant because of the type of planes used in World War II. Or because those planes operated from dirt, sod, or prefabricated runway surfacing materials. Those who have that opinion have an incomplete understanding of how the Ninth Air Force operated and what they accomplished.

Between D-Day on June 6th, 1944, and V-E Day on May 8th, 1945, the Ninth Air Force supported First, Third, and Ninth Army as they drove the Wehrmacht from the beaches of Normandy, into Belgium, across the Rhine, and into Germany. The VII Corps commander, Lieutenant General J. Lawton Collins, following the war, stated that "We could not possibly have gotten as far as we did, as fast as we did, with as few casualties, without the wonderful air support that we have consistently had."[171] While the fighter squadrons, groups, and wings of World War II have received the most credit and notoriety, these accomplishments would not have been possible without the tireless contribution from the men of Ninth Air Force's support

[171] The Ninth Air Force, *Book V: Ground Force Annexes*, Operational History of the Ninth Air Force, 1945, sec. II, p. 2, Reel B5588, Air Force Historical Research Agency (AFHRA).

organizations, such as IX Engineer Command, IX Air Force Support Command, and the airdrome squadrons. These men enabled a system that made Ninth Air Force into the mobile, tactical air force that Air Chief Marshal Portal advocated for at the Casablanca Conference in 1943.[172]

In this system, army ground plans would necessitate that the TAC's clutches move forward with the Army. Aviation engineers would then plan, reconnoiter, and build or rehabilitate the new airfields. A few days before airfield completion, an airdrome squadron would arrive to receive necessary supplies, set up the field, and receive the fighter groups that would make the airfield their new home. Once the airfield was complete and the fighter group was self-sufficient, the engineer aviation battalion and airdrome squadron would move on to the next location, and the cycle would repeat itself. By V-E Day, the Ninth Air Force had operated on 241 airfields, 80 of which were hard-surfaced. Finally, the entire organization was continually presented significant challenges both from Nazi Germany and the friction inherent in war. So, while the EAF concept from 1998 might be a part of the Air Force's history, her true expeditionary roots are found in the tactical, mobile Ninth Air Force of the ETO.

Recommendations

These challenges and their associated solutions lead to several recommendations for the modern Air Force to consider. Considering the Ninth Air Force's experiences in the ETO combined with a base-level understanding of the ACE concept, this study yields thirteen recommendations for the Air Force to consider. The first eleven recommendations come directly from the lessons born out of the challenges and solutions that the Ninth Air Force faced in the ETO and are based on the modern applicability discussions in chapter four. These recommendations are summarized in Figure 16 below.

[172] US Department of State, *CCS Minutes, January 21, 1943*, 676.

Summary of Modern Applicability Recommendations		
Movement and Manuever		
The Air Force should consider…		
(Rec #1)		…using a "clutch-like" basing approach to centralize communications, higher echelon maintenance, and supply depots.
(Rec #2)		...using the airdrome squadron and air-delivered supplies as a model to form a mobile sustainment team capable of securing, surveying, rehabilitating, supplying, and operating from a small airfield for a finite number of days.
(Rec #3)		…providing general mine and booby trap training to all deploying units.
(Rec #4)		…including mine detection and deliberate removal training in the BOS-I multi-capable airmen training syllabus and ensure that these airmen are properly equipped for such operations.
Command and Control		
The Air Force should consider…		
(Rec #5)		…organizing, training, and equipping prospective expeditionary wings for independent planning.
(Rec #6)		…equipping prospective expeditionary wings with duplicate operations equipment to enable the wing HQ, at the hub, to quickly flush to an alternate HQ location, at one of the spokes, that is already setup.
(Rec #7)		…evaluating Ground Liaison Detachment (GLD) manning, training, and equipping; considering the increased responsibilities that GLDs will incur given that the AOC and BCD are cutoff from lower echelon units.
Sustainment		
The Air Force should consider…		
(Rec #8)		…locating and cataloging sources of raw materials—such as quarries, cement and asphalt plants, lumber yards, agricultural sources, and water sources—in potential operating locations.
(Rec #9)		…establishing secondary and tertiary sources for critical supplies (e.g. POL) if an existing plan relies on another military service or partner nation as a sole source of critical supplies.
Protection		
The Air Force should consider…		
(Rec #10)		…adding CC&D training to mission generation and BOS-I multi-capable airmen training syllabi to complicate enemy targeting and increase airbase survivability.
(Rec #11)		…augmenting their chosen basing approach with the shell game basing approach, combined with an information operations campaign, to deceive the enemy into thinking that the Air Force is operating from more airfields than they actually are.

Figure 16. Summary of Modern Applicability Recommendations. Created by Author.

The above recommendations are written with the "big picture" in mind and mostly exclude refined details. Again, the purpose of this monograph is to provide the reader with historical context for ACE and offer historical lessons that planners should consider. If any of these lessons or recommendations are deemed useful, they still require further research to be of

practical use. Fortunately, there are enough primary historical documents archived to write an individual monograph on each of these recommendations. Therefore, the Air Force should consider commissioning a study—either internal or external—to further explore the historical lessons brought up in this monograph ***(Rec #12)***.

Furthermore, through purposeful delimitations, the author only researched the Ninth Air Force in the ETO between D-Day and V-E Day. While the Ninth Air Force in the ETO is the most prominent example of an expeditionary air force at war, there are many more historical examples of air forces operating from dispersed small airfields throughout history. Such historical operations and planning efforts likely have numerous lessons that ACE planners could consider and heed to improve the overall ACE concept. Therefore, professional military education students, civilian graduate students, and the Air Force should consider researching these other historical examples in search of further historical context and lessons that ACE planners might consider ***(Rec #13)***.

Chapter Conclusion

The experiences that the Ninth Air Force accumulated as they built, rehabilitated, supplied, and operated on 241 airfields across the European continent offer important historical context and many lessons that the Air Force could learn from as they develop and implement the ACE concept. General Goldfein was right; the Air Force must return to its expeditionary roots. But the Air Force should not forget that its *true expeditionary roots* lay in the mobile, tactical Ninth Air Force of the ETO. So, we should probably start with a deliberate effort to dive into the lessons from our expeditionary past; this monograph is only a part of that effort.

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