

REPORT DOCUMENTATION PAGE			<i>Form Approved</i> OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.				
PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.				
1. REPORT DATE (DD-MM-YYYY) 05-03-2011		2. REPORT TYPE Master of Military Studies Research Paper		3. DATES COVERED (From - To) October 2010 - April 2011
4. TITLE AND SUBTITLE Marine Corps Close Air Support Development from Guadalcanal to Okinawa			5a. CONTRACT NUMBER N/A	
			5b. GRANT NUMBER N/A	
			5c. PROGRAM ELEMENT NUMBER N/A	
6. AUTHOR(S) Rasmussen, Richard A.			5d. PROJECT NUMBER N/A	
			5e. TASK NUMBER N/A	
			5f. WORK UNIT NUMBER N/A	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) USMC Command and Staff College Marine Corps University 2076 South Street Quantico, VA 22134-5068			8. PERFORMING ORGANIZATION REPORT NUMBER N/A	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSOR/MONITOR'S ACRONYM(S) N/A	
			11. SPONSORING/MONITORING AGENCY REPORT NUMBER N/A	
12. DISTRIBUTION AVAILABILITY STATEMENT Unlimited				
13. SUPPLEMENTARY NOTES N/A				
14. ABSTRACT Marine Corps aviation experienced a challenging start as many believed it was merely a novelty with little legitimate military application. Innovative Marine aviators developed the basic tenets of dive bombing and close air support in Haiti and Nicaragua, and the Marine Corps continued as the only service to work on these issues seriously prior to World War II. Guadalcanal was the first major Marine Corps operation in the Pacific Theater with extremely rudimentary close air support. As Marines island-hopped across the Pacific, each subsequent operation presented lessons learned for the next, and the most important development involved air liaison parties directly controlling close air support strikes at the ground commander's request. The Philippines and Okinawa campaigns highlighted the success of this concept in support of both Marine and Army units. Marine Corps close air support's development in the Pacific Theater of World War II relied upon the air liaison party concept of control. This crucial innovation paved the way for future close air support tactics and doctrine and proved essential for Marine Corps aviation's relevance and longevity.				
15. SUBJECT TERMS United States Marine Corps Close Air Support, Forward Air Controller, Tactical Air Control Party, Air Liaison Party, Island Hopping, World War II Pacific Theater				
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	
a. REPORT Unclass	b. ABSTRACT Unclass	c. THIS PAGE Unclass	18. NUMBER OF PAGES 43	
			19a. NAME OF RESPONSIBLE PERSON Marine Corps University / Command and Staff College	
			19b. TELEPHONE NUMBER (Include area code) (703) 784-3330 (Admin Office)	

United States Marine Corps
Command and Staff College
Marine Corps University
2076 South Street
Marine Corps Combat Development Command
Quantico, VA 22134-5068

MASTER OF MILITARY STUDIES

TITLE:

MARINE CORPS CLOSE AIR SUPPORT DEVELOPMENT
FROM GUADALCANAL TO OKINAWA

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

AUTHOR:

Richard A. Rasmussen
Maj USMC

AY 10-11

Mentor and Oral Defense Committee Member: Craig A. Swanson PhD
Approved: [Signature]
Date: 29 April 2011

Oral Defense Committee Member: CHARLES D. MCKENNA, Ph.D.
Approved: [Signature]
Date: 29 APRIL 2011

EXECUTIVE SUMMARY

Title: MARINE CORPS CLOSE AIR SUPPORT DEVELOPMENT FROM GUADALCANAL TO OKINAWA

Author: Major Richard Rasmussen, United States Marine Corps

Thesis: The introduction of air liaison parties in the Pacific Theater, allowing Marine aviators attached to the infantry to control air strikes directly, was the most crucial Marine Corps close air support development of World War II.

Discussion: Marine Corps aviation experienced a challenging start as many believed it was merely a novelty with little legitimate military application. Innovative Marine aviators developed the basic tenets of dive bombing and close air support in Haiti and Nicaragua, and the Marine Corps continued as the only service to work on these issues seriously prior to World War II. Guadalcanal was the first major Marine Corps operation in the Pacific Theater with extremely rudimentary close air support. As Marines island-hopped across the Pacific, each subsequent operation presented lessons learned for the next, and the most important development involved air liaison parties directly controlling close air support strikes at the ground commander's request. The Philippines and Okinawa campaigns highlighted the success of this concept in support of both Marine and Army units.

Conclusion: Marine Corps close air support's development in the Pacific Theater of World War II relied upon the air liaison party concept of control. This crucial innovation paved the way for future close air support tactics and doctrine and proved essential for Marine Corps aviation's relevance and longevity.

DISCLAIMER

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

QUOTATION FROM, ABSTRACTION FROM, OR REPRODUCTION OF ALL OR ANY PART OF THIS DOCUMENT IS PERMITTED PROVIDED PROPER ACKNOWLEDGEMENT IS MADE.

Illustrations

	Page
Figure 1. De Havilland DH-4.....	2
Figure 2. Dauntless SBD.....	7
Figure 3. Grumman TBF Avenger	13
Figure 4. Chance Vought F4U Corsair.....	22

Tables

	Page
Table 1. Standardized Close Air Support Request.....	11
Table 2. Bomb Safety Margin.....	12

Preface

This exploration of Marine Corps close air support in World War II began with a profound interest in Marine Corps aviation and World War II combined with my experiences as a forward air controller in Iraq with Second Battalion, Fourth Marines. I was curious about the history and development of close air support tactics from their infancy to the relatively refined procedures developed by the end of the World War II. I began my research with well-recognized secondary sources for background and then focused on primary sources from the Gray Research Center, The Marine Corps History Division, and *Marine Corps Gazette* articles largely written by veterans of the Pacific Theater. After considering a variety of areas upon which to focus, I chose to consider factors exerting the most influence on close air support development in the Pacific Theater. Air liaison parties and their influence on close air support effectiveness stood out as the dominant theme throughout my research and prompted this paper's emphasis on their development in concert with the evolving doctrine.

Table of Contents

	Page
DISCLAIMER	i
LIST OF ILLUSTRATIONS	ii
LIST OF TABLES	iii
PREFACE	iv
INTRODUCTION.....	1
EARLY CLOSE AIR SUPPORT	1
THE LATE INTERWAR YEARS.....	4
GUADALCANAL	6
NEW GEORGIA.....	8
AIR LIAISON PARTIES	9
BOUGAINVILLE.....	11
THE PHILIPPINES.....	13
IWO JIMA.....	18
OKINAWA	20
LESSONS LEARNED	23
CONCLUSION.....	23
APPENDIX A: THE ADVANCE OF MARINE AVIATION THROUGH THE PACIFIC IN WORLD WAR II	25
APPENDIX B: MAP OF THE SOLOMON ISLANDS 1943	26
APPENDIX C: MAP OF THE PHILIPPINES	27
APPENDIX D: MAP OF IWO JIMA.....	28

APPENDIX E: MAP OF OKINAWA	29
GLOSSARY	30
BIBLIOGRAPHY	31
ENDNOTES	33

Introduction

Close air support is not just a physical act of war. It is, instead, one of the indefinable abstracts of combat that can, by its presence, heighten morale and, by its absence, destroy morale. Moreover, its contribution to battle is immediate, and its results readily apparent to both friend and foe.¹

-Susan Mercer Williams and Frank J. Mirande from *"When the Chips are Down . . . " A Historical Sketch of Close Air Support*

It has been said that the United States does not need a Marine Corps, but rather it wants a Marine Corps. The same could be said concerning Marine Corps aviation through the years, and proponents have continually improved its capabilities. Marine Corps structure revolves around the fact that all occupational specialties exist to support infantry Marines on the ground. Therefore Marine aviation established and built its relevancy and necessity based upon its ability to directly support the Marines at the tip of the spear. Innovators in Haiti and Nicaragua proved that Marine aircraft could effectively bomb enemy forces, and Marine aviation championed dive bombing in the interwar years preceding World War II when close air support (CAS) of troops in contact with the enemy came of age. While the capability clearly had potential, issues of coordination, accurate targeting, and avoiding fratricide remained as the Marines began the island-hopping campaign in the Pacific Theater at Guadalcanal. Marine aviation incorporated air liaison parties (ALPs) to bridge the gap between ground commanders and highly-capable ground attack aircraft in an effort to solve these problems. Lessons learned successively contributed to subsequent campaigns relevant to CAS development in New Georgia, Bougainville, the Philippines, Iwo Jima, and Okinawa. New weapons, equipment, and aircraft appeared throughout the war, but ALP integration proved to be the most critical Marine aviation development in the Pacific Theater of World War II.

Early Close Air Support

At its most effective, the close air support mission is a physically demanding task, requiring the pilot's active participation in the land battle. For a moment in time, as he makes his pass, the pilot is one with the men on the ground—he hears, sees, and feels what they do, and he is facing the same array of weapons they are.²

-Susan Mercer Williams and Frank J. Mirande from *"When the Chips are Down . . . " A Historical Sketch of Close Air Support*

The first instance of Marine air support of ground troops occurred in Haiti during the 1919 Caco Rebel uprising. The Fourth Air Squadron commanded by Captain Harvey Mims and equipped with De Havilland DH-4B biplanes deployed to Haiti with their pioneering aircraft. They had no bombsights and no mechanism for bomb delivery, so the enterprising Lieutenant S. H. Sanderson decided to rig a bomb delivery system using a canvas mail bag under the fuselage with a rope to the cockpit for bomb release. His technique involved approaching the target in a shallow dive and releasing his payload at 250 feet, and in doing so, he introduced bombing in support of front line troops in difficult terrain.³ Although this accomplishment was significant, skeptics in government and the Marine Corps challenged the necessity of the new Marine aviation organization.

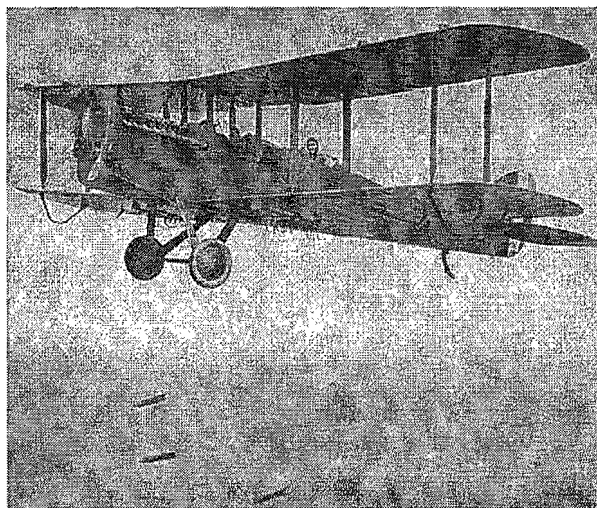


Figure 1. A De Havilland DH-4 dropping bombs. Source: Hampshire Airfields, <http://daveg4otu.tripod.com/airfields/nos21.html>

The first Marine Corps aviator, Alfred Cunningham, articulated the challenge of Marine aviation acceptance in a September 1920 *Marine Corps Gazette* article:

One of the greatest hardships which Marine Corps Aviation must now overcome is a combination of doubt as to usefulness, lack of sympathy, and a feeling on the part of some line officers that aviators and aviation enlisted men are not Marines. It is fully realized that the only excuse for aviation in any service is its usefulness in assisting troops on the ground to successfully carry out their operations.⁴

He further relayed prevailing infantry opinion of the day in saying: "The question regarding aviation which is of most interest to the Marine Corps is: Of what practical use is it to us? We see planes flying around and they seem to be enjoying themselves, but how will they help us perform our mission?"⁵ Cunningham recognized that Marine aviation required a transition from mere novelty to necessity, although it would be almost twenty-five years before Marine aviators developed their full potential for supporting ground troops.

Marine aviation had no CAS role in World War I, and the next employment did not occur until January 1927 in Nicaragua as the Fifth Marines supported the Diaz forces against the Moncada Rebels following a violent revolution. Major Ross Rowell commanded the VO-1M squadron consisting of six DH-4 biplanes in support of Marine Corps operations. On 15 July several hundred rebels besieged the Marines' 37-man garrison at Ocotal alongside 48 Nicaraguan National Guards. Rowell led five of his aircraft in a bombing column diving from 1,500 feet and pulling out at 600 feet, thereby saving the men from almost certain defeat while inflicting an estimated 50 to 200 casualties and 40 to 80 killed.⁶ According to Rowell, "Since the enemy had not been subjected to any form of bombing attack they had no fear of us. They exposed themselves in such a manner that we were able to inflict damage which was out of proportion to what they might have suffered had they taken cover."⁷ This was the first known organized dive

bombing attack and the first time Marine pilots employed low-altitude CAS for troops in contact with the enemy.⁸

Nicaragua also became the proving grounds for the first ground-controlled CAS mission on 8 October 1927. Lieutenant E. A. Thomas and Sergeant F. E. Dowell crashed on a mission and 175 rebels attacked the small rescue patrol approaching the downed aircrew. The patrol leader used ground panels indicating the distance and direction to the enemy and requested air attacks as further aircraft arrived on station. The ensuing bombing and strafing runs saved the patrol as necessity produced rudimentary ground-controlled CAS.⁹ Marine aviation had experience dropping bombs and strafing in close proximity to friendly troops following this event, and ground commanders began to take ownership of CAS by directing the aircraft to the enemy.

The Late Interwar Years

Marine Corps aviation remained at the forefront of CAS development in the interwar years. During this time, Marine aviators firmly believed that dive bombing was the best, most accurate, and most economical method of delivering bombs on target both on land and at sea.¹⁰ The Marine Corps accordingly conducted exercises through the 1930s to develop and refine CAS for the infantry. They faced multiple problems in this effort as newer aircraft flew faster and higher, making it more difficult for pilots to orient on friendly and enemy positions. Some pilots were less familiar with infantry tactics, unlike the original aviators who had transferred from the infantry, further complicating matters. Finally, they needed better radio communication, more joint training, and better methods of target location and description.¹¹

Alfred Cunningham recognized the requirement for better radios and communication procedures as the visionary first Marine Corps aviator. Improvements in radio quality and

portability were essential for developing and improving procedures for air-ground integration.

Cunningham humorously wrote between the wars that:

There has been developed a portable radio and radio telephony ground set which is so small and easily set up that one can be carried by two or three men or on the back of a mule, horse, or donkey. In future operations, every unit which has these—and every unit should have one—will be in instant communication with the planes and through them with any other station.¹²

He contended that the military did not use radio communication between ground troops and aircraft to their advantage during the latter part of World War I. Ultimately he predicted that in the future, airplanes with their superior speed and visibility, together with ground signals and radios, would cooperate to significantly increase the effectiveness of their air-ground integration.¹³

In 1939 the Navy General Board codified the air mission as follows: “Marine Aviation is to be equipped, organized and trained primarily for the support of the Fleet Marine Force [FMF] in landing operations and in the support of troop activities in the field; and secondarily as replacement squadrons of carrier based naval aircraft.”¹⁴ Efforts focused on supporting the ground troops during amphibious landings by bridging the gap between naval gunfire ceasing and Marines landing, and by attacking targets impeding forward movement once ashore. This progress notably occurred during a time of fiscal conservation and restraint when other military services merely paid the issue of CAS lip service or ignored it entirely.¹⁵

In 1940 Marine Corps Schools taught that the air arm’s offensive power should be used only under the following circumstances: against targets out of ground weapons’ range, when artillery cannot be sufficiently applied, on targets unsuitable for ground weapons, and when artillery’s absence may cause a campaign to fail.¹⁶ At the most basic level, CAS would bridge the gap between naval gunfire preparation before an amphibious assault and artillery setup on the

beach after the first troop waves come ashore.¹⁷ The Marine Corps thus set the stage doctrinally for operations in the near future involving further CAS employment and development.

Congress foresaw the impending conflict and authorized a “Two Ocean Navy” in late-1940, including an increase to 15,000 naval aircraft. The Marine Corps would receive 1,764 of these aircraft assigned to 32 squadrons in two Marine Aircraft Wings (MAWs), with each wing assigned to a division in recognition of aviation’s supporting role. Observers of the European War convinced Congress to approve another wing and four base defense air groups as well.¹⁸ However, Marine aviation started small with 206 aircraft on 6 December 1941,¹⁹ and by the end of 7 December only 145 serviceable aircraft remained with the Marine Corps at war. In 1942 the Navy established its 27,500 aircraft program, spurring Marine aviation’s expansion to five MAWs and roughly 4,000 aircraft.²⁰ This foresight enabled Marine aviation to rise to the challenge of Japanese aggression in the Pacific Theater with sufficient aircraft to provide organic CAS.

Guadalcanal

The Marine Corps began its island-hopping campaign at Guadalcanal in the Solomon Island chain as its first advance into Japanese-held territory (see Appendices A and B). Task Force 61’s three carriers provided air support for the operation coordinated by the Air Control Center aboard the Attack Force Commander’s flagship, the USS *McCawley*. This set the stage for inflexible air support with no direct communication from the landing forces to the aircraft, and the embarked controllers acting as the intermediary agency.²¹ The Navy left with the aircraft carriers rather than risk losing them to approaching Japanese warships, highlighting a fundamental difference between the Navy and Marine Corps. This decision left the Marines without any aircraft to defend against Japanese air attack for eleven days until VMF-223 arrived

as the first squadron at Henderson Field on Guadalcanal.²² As the friendly airplanes flowed in, one Marine expressed the opinion of many by saying “I always thought the most beautiful sight I’d ever seen would be the Golden Gate, but . . . if those SBDs [dive bombers] ain’t just about the purtiest [*sic*] sight any man could ever wish for.”²³

Guadalcanal allowed Marine pilots to provide the first Marine CAS in the Pacific Theater, with the Dauntless SBD dive bombers flying many of the missions. Ground requests went directly to the Division located at Henderson Field, which processed them and passed the information along to the aircrews. The pilots briefed the target specifics before takeoff, and they often walked up to the front lines themselves to observe the next target before a mission.²⁴ Higher priority tasking subverted much of the CAS mission and development during the first part of the war, such as air superiority and the support missions of reconnaissance and bombing Japanese shipping. This often forced the Marine aviators to provide security rather than focusing on their primary CAS mission.²⁵

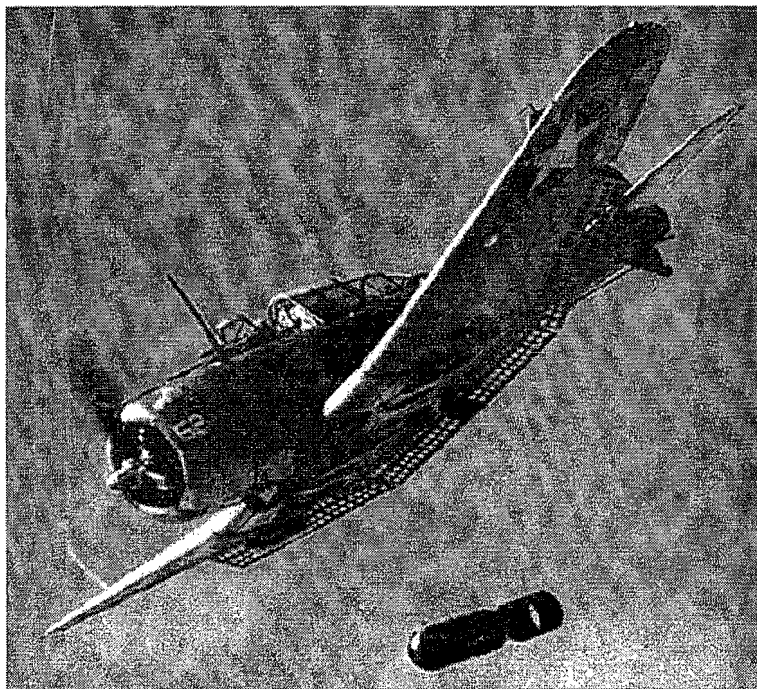


Figure 2. A Dauntless SBD dive bombing. Source: http://www.ask.com/wiki/SBD_Dauntless

Guadalcanal CAS was rudimentary compared to that of later operations, but lessons learned led to significant developments in the air/ground relationship. The landing phase produced multiple learning points, highlighting the fact that CAS was essential for suppressing the enemy during an opposed amphibious landing. Ground units required more direct communication with the aircraft and reliable portable radios to do so effectively. The request system needed to be more responsive using fewer request levels, but with higher headquarters monitoring for safety and prioritization purposes when needed. Finally, air crews required specific CAS training combined with a thorough knowledge of the ground situation.²⁶ Major General Vandegrift, 1st Marine Division Commander, wrote in his official Guadalcanal report that:

Both (bombardment and fighter) united to support the ground forces . . . in spite of poor air-ground communications. . . . Steps were taken to improvise air liaison parties. These proved a distinct improvement but thus remains a need for regular organized air-ground communication teams within infantry regiments.²⁷

Thus, the leadership understood the need for ALPs after the limited CAS missions completed at Guadalcanal.²⁸

New Georgia

New Georgia was the next major stop in the Solomon Islands en route to Bougainville and the Japanese stronghold of Rabaul. Marines first began officially using ALPs here to coordinate air strikes using radios, cloth panels, Aldis lamps, and/or pyrotechnics. The tactics and execution were primitive compared to future operations, and of the 44 total air requests, only seven came from the front lines with four of those actually executed. The reasons for this underutilization were twofold: the ground commanders were justifiably afraid of collateral damage with danger-close air strikes, and artillery was generally better suited for the job. Regulations limited CAS to 500 yards from friendly lines (300 yards in an emergency), while

artillery could be called in within 100 yards.²⁹ Ground commanders generally did not see the benefit of CAS when artillery was more responsive and could be used closer to friendly forces.

New Georgia operations resulted in important lessons learned for CAS. Ground commanders used many preplanned missions to save time, but often advanced further than planned. Under these circumstances, they had to fall back to avoid being hit by a preplanned airstrike due to insufficient radios and procedures to call off the strike. Meanwhile the enemy would frequently move back up and occupy the previous Marine positions. Maps also presented a problem for pilots without a grid system or sufficient detail, and they frequently could not determine their own location, let alone that of the target area.³⁰ Ground units had the option of target designation with smoke shells, but this required good communication with the liaison parties which was problematic with their unreliable radios.³¹ However, the ALPs developed talk-on techniques without prior mission coordination, leading to successful attacks when the target position was well-marked and communicated.³²

Air Liaison Parties

For the men on the ground . . . just having friendly aircraft overhead to support them was often the psychological boost they needed to complete a key operation. If the close air support aircraft did indeed destroy a portion of the enemy's military might, they expected no less. But, to call for 'air' in a critical situation and not receive it could be tantamount to defeat.³³

-Susan Mercer Williams and Frank J. Mirande from *"When the Chips are Down . . . " A Historical Sketch of Close Air Support*

The idea of the ALP originated from the Atlantic Fleet as pioneered in Sicily and North Africa with Navy and Marine officers involved in those operations.³⁴ The Amphibious Corps, Atlantic Fleet adopted the concept in the spring of 1942 at Quantico while conducting experimental operations with the 1st Marine Division. In late-1942 the Corps transferred to California and became the Amphibious Corps, Pacific Fleet as development continued.³⁵

Although liaison teams improvised on Guadalcanal and New Georgia, preparation for Bougainville officially brought the concept to Marine Corps combat in the Pacific Theater.

Marines began training ALPs three months prior to landing at Bougainville, and this laid the groundwork for the beginning of modern CAS tactics. Three pilots and six radiomen from the 1st MAW attached to the 3d Marine Division as air liaisons to begin official training for the operation. Lieutenant Colonel John Gabbert, the Division Air Officer, stood up the Air Liaison Party School for the nine men assigned, as well as one operations officer from each regiment and battalion. Classes covered CAS capabilities and limitations, standardized request procedures (see Table 1), and air-ground communication.³⁶ Lessons from Guadalcanal led to three improvement goals of refining target designation using colored smoke, precisely determining bomb and fuse combinations and effects, and determining danger close margins for these combinations. The training also focused on the ALP capabilities of advising the ground commander, requesting CAS, and tactical direction of CAS.³⁷ The school proved especially valuable and effective in establishing a dialogue and relationship between the aviators and ground unit operations officers, whose confidence in CAS had been shaken by previous fratricide incidents. The experience restored their faith in the system and in Marine CAS capabilities.³⁸

As the war progressed, the ALP doctrinally became the most basic unit of the air support structure in the Joint Assault Signal Company's (JASCO's) air liaison section. Each Marine or Army Division included an attached JASCO containing 13 ALPs, and each ALP consisted of one officer and three to seven enlisted men. Every battalion, regiment and division headquarters had one attached ALP for liaison between the ground commander and the aircraft via the Commander Support Aircraft.³⁹

1	Type of attack
2	Target description
3	Target location
4	Time of attack
5	Location of front lines in relation to target and whether marked
6	Whether target can be marked
7	Whether observation, direct or indirect

Table 1. Standardized Close Air Support Request⁴⁰

The Landing Force Air Support Control Unit (LFASCU) constituted the largest air support unit, consisting of 22 officers and 70 enlisted men and designed for major operations such as the upcoming Iwo Jima invasion.⁴¹ This unit transitioned ashore during amphibious assaults as the agency in charge of all aircraft in the target area (except artillery and naval gunfire spotter aircraft). Each task force had three to four of these units with one embarked for pre-landing bombardment, one to take over upon securing the beachhead, and the rest in reserve.⁴² The crucible of amphibious warfare produced a steep learning curve, and these organizations proved their merit in upcoming operations.

Bougainville

The assault on Bougainville secured the last major objective in the Solomon Islands chain. This marked the end of major Marine Corps air operations for the near term and significantly benefited from the three-month Air Liaison Party School based upon CAS lessons learned from the previous operations. Resultant tactics, techniques, and procedures produced an important milestone as they finally started resembling the modern conception of CAS. Tactics continued evolving as the Japanese had learned that Americans marked their positions with white

smoke before an air strike, so they began to do the same, leading units to use colored smoke in this campaign to avoid fratricide. Liaison parties also began using the new safety margin table to determine and standardize safe distances for different bomb types (see Table 2).⁴³ These improvements that are nearly taken for granted today were revolutionary at the time.

Bomb (Pounds)	Normal Use (Yards)	Emergency Use (Yards)
100	100	75
500	500	300
1,000	1,000	500
2,000	1,000	700

Table 2 Bomb Safety Margin⁴⁴

The 3d Marine Division praised Marine aviators following actions on 18 December 1943 after a wise change in bombing tactics. Grumman TBF Avengers from VMTB-134 flew in with 4/5 of a second delayed fuses on their bombs, allowing the munitions to penetrate the terrain further before exploding, and giving the aircraft more time to safely clear the explosions and avoid self-inflicted damage. They attacked the infamous “Hellzapoppin’ Ridge” which held 300 firmly entrenched Japanese who had been resisting for days. Artillery proved ineffective in dislodging the tenacious defenders, but CAS made all the difference while flying as low as 50 feet and as close as 75 yards from friendly forces. Close air support impacted the battlefield against targets and terrain beyond the capabilities of artillery, possibly for the first time in the war, while increasing the Marines’ confidence in their air cover.⁴⁵ The commanding general was impressed and noted that the CAS was as accurate as artillery but with a superior surprise factor.⁴⁶

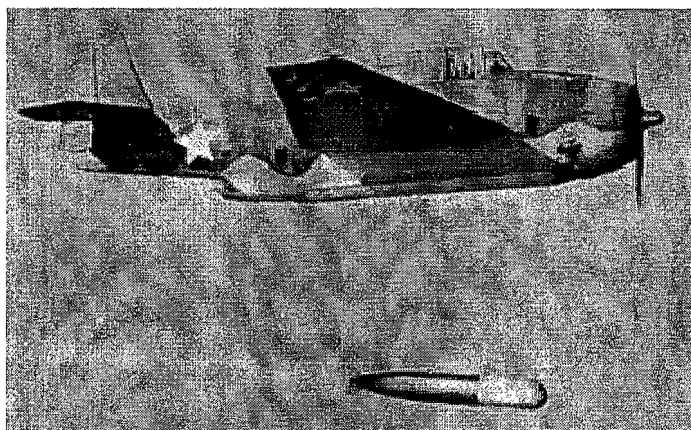


Figure 3. A Grumman TBF Avenger drops a torpedo. Source: Operation Rising Sun, <http://www.operationrisingsun.com/USP.html>

Bougainville was significant as all ground attack missions at the front lines constituted true CAS within 500 to as close as 75 yards of friendly lines.⁴⁷ This effectiveness proved the ALP's essential capability attached to the ground units as they briefed airborne aircraft for expedited attacks on demand.⁴⁸ Challenges persisted as the support remained rudimentary, hampered by insufficient ground-portable communication equipment. The ALPs and their CAS aircraft also experienced inefficiencies as they lacked a central air control agency to coordinate all aircraft in the battle space.⁴⁹ This would be the last time until Okinawa that Marine Air would provide CAS for Marines, and the successes in the Solomons contributed to General MacArthur's decision to have Marine pilots control CAS for the Army in the Philippines.⁵⁰

The Philippines

By mid-1944 the Marine aviators in the Solomons felt that they were languishing while the war had passed them by. Navy and Army Air Corps pilots continued on the offensive while the Marines remained, mopping up Japanese positions on bypassed islands. Much to their relief, Major General Ralph Mitchell requested that General MacArthur include MAG-24 in his return to liberate the Philippines. Mitchell understood that Marines would be more willing to provide

CAS than their Army Air Corps counterparts due to their doctrine and experience.⁵¹ Army Air Corps FM 100-20 differed significantly from Marine CAS doctrine by pessimistically stating:

In the zone of contact, missions against hostile units are most difficult to control, are most expensive, and are, in general, least effective. Targets are small, well dispersed and difficult to locate. In addition, there is always a considerable chance of striking forces. . . . Only at critical times are contact zone missions profitable.⁵²

The Army Air Corp's liaison parties also differed greatly from those of the Marines. An average Army liaison party consisted of 29 officers and enlisted men with a jeep, a weapons carrier, and a 2 1/2-ton amphibious truck, all of which would be far too cumbersome and vulnerable on a fast-advancing front in the Philippines. The Marine ALPs would offer more flexibility and experience based upon their operations in the Solomon Islands.⁵³

The Marines had three months in Bougainville to prepare for the Philippine campaign, which would prove to be the most interesting and rewarding ALP work of the war given their level of autonomy and effectiveness in support of the Army.⁵⁴ MAG-24 had developed and refined their CAS tactics on Bougainville with the Army's 37th Infantry Division using their ALPs, consisting of a jeep with a pilot or intelligence officer and a radioman. They used multiple methods of directing the pilots to each target, including radio, cloth panels, colored smoke, rockets signals, or any other available means. Those pilots who entered the Marine Corps before or during the early years of the war previously served as ground officers, making it easier for them to accept the fact that air was an additional support weapon to be used at the ground commander's discretion, and contributing to their effectiveness. Ultimately both MAG-24 and MAG-32 under Colonel Clayton Jerome, consisting of seven SBD squadrons and 174 aircraft, headed to the Philippines to support the operation.⁵⁵

Lieutenant Colonel Keith McCutcheon, the MAG-24 Operations Officer, contributed the most to CAS doctrine and tactics in the Philippines as he pushed his pilots and ALPs to provide

the finest support available. He wanted to transition from the inflexible, pre-briefed missions of the past to flexible CAS directed by the ground commander as needed, and he realized that it would be truly effective only if used exactly when and where the commander desired.⁵⁶

McCutcheon learned that the 5th Air Force and the Navy would be providing "Support Air Parties" but did not plan direct communication with the aircraft, so MAG-24 trained their own ALPs with direct communication techniques as the most logical and flexible control method. Current Marine Corps CAS doctrine included an Air Coordinator, an experienced pilot (often a squadron commanding or executive officer) who directed aircraft to the targets, the ground observer in the ALP, and a radio-gunner for target spotting, marking and strafing from the gunner's seat of an SBD. McCutcheon focused training on attacking targets that other weapons could not reach and coordinating attacks with other support weapons. His aircraft had two methods of employment: ready or strip alert, or "on station/air alert" with an air coordinator airborne to sequence the aircraft, which resulted in the most responsive and frequently-used support method.⁵⁷

Pilots trained in flights of nine to eighteen aircraft for these strikes. Communication was the biggest challenge with too many agencies using one net, but with the separation onto four nets utilizing the SBDs' two radios, the new doctrine largely solved this problem. Additionally, those pilots who had served on ALPs enjoyed a more complete perspective and contributed significantly to the effort. When they returned to the cockpit they possessed the distinct advantage of being more attuned to ground issues after experiencing life from the infantryman's perspective. They proved to be more disciplined pilots with a better understanding of the ground situation while providing CAS. All of these pilots trained to modern tactics in which the ALP would observe the enemy target and give the first aircraft a talk-on, adjusting off of the smoke

mark if used, and calling for dry runs if there was any question about target and friendly locations.⁵⁸ After the first bomb's impact, the liaison would adjust subsequent bombing runs verbally based upon direction and distance from the last impact.⁵⁹ The Marine Air-Ground team was armed with the knowledge and skill required to support the Army in their effort to retake the Philippines.

MAG-24 began flying CAS one week after the first squadron of SBDs arrived. Major General Verne Mudge, the 1st Cavalry Division Commander, boldly tasked the SBDs to cover his left flank on their nearly month-long assault to Manila (see Appendix C). MAG-24 employed the constant air cover of nine SBDs during this time from dawn to dusk, defending a division's flank with aircraft alone for the first time in history. Close air support missions began on the fourth day of the offensive, and confidence in the pilots increased as the troops witnessed the skill and precision of the bombing runs.⁶⁰

Mudge absolutely trusted Marine CAS, but Major General Edwin Patrick, the 6th Infantry Division Commander, remained skeptical and would not allow attacks within 1,000 yards of his men. At one point while accompanying Mudge he observed SBD air strikes guided by air liaison Captain Francis Godolphin precariously perched on a water tower for the best target observation. A white phosphorus bomb first marked the target on Godolphin's command. The following bomb struck the reverse slope, the next impacted behind the first, and the remaining seven scored direct hits on the target. The strike killed multiple Japanese, and the remaining enemy fled for their lives, abandoning fifteen mortar tubes and eight machineguns. Patrick immediately became a believer, so when Mudge noted that the bombs fell within Patrick's 1,000-yard limit, he reportedly replied that he did not care how close they hit, and he wanted some Marine CAS!⁶¹ Mudge praised the Marines in his frank and matter-of-fact manner,

saying "On our drive to Manila I depended solely on the Marines to protect my left flank from the air against possible Japanese counter-attack. The job they turned in speaks for itself. We are here."⁶²

Throughout the Philippine campaign, Marine aviators and ALPs refined and perfected CAS tactics, relying almost entirely on the venerable SBD dive bombers. Highly trained and battle tested pilot and gunner crews worked in tandem to provide accurate, reliable support, and they were disappointed at times when underutilized by the Army.⁶³ Captured enemy documents corroborated by the testimony of Japanese on bypassed islands stated that the SBD was the most feared U.S. aircraft in the Pacific, and it certainly lived up to its reputation in the Philippines.⁶⁴ Japanese prisoners of war admitted that some were afraid to shoot at U.S. aircraft for fear that the deadly SBD dive bombers would retaliate, and the press dubbed them the "Diving Devildogs of Luzon."⁶⁵ Marine aviation accounted for only thirteen percent of U.S. aircraft in the Philippines, but they flew 8,556 sorties, and the SBDs flew just under fifty percent of total individual sorties of the campaign.⁶⁶

Marine aviation received more superlative praise from the Philippines than any other operation in World War II thanks to the satisfied Army Generals on the receiving end of air support. Lieutenant General Robert Eichelberger, the 8th Army Commander, said:

The value of close support for ground troops as provided by these Marine fliers cannot be measured in words and there is not enough that can be said for their aerial barrages that have cut a path for the infantry. From all quarters, commanders down to the men with the bayonets, I have heard nothing but high tribute. Great going and keep blasting.⁶⁷

The SBD pilots and liaison teams certainly accomplished their goal of providing an exceedingly flexible supporting arm to the infantry. Major General Charles Muller, the 25th Division Commander, said "There is no way to measure factors in the success of the operation. . . . The dive bombers hit targets that were unreachable by artillery and speeded up the advance toward

the final objective.”⁶⁸ This operation’s impact exceeded that of all others in the Pacific with Marines providing their own organic CAS, and it represents one of the most important contributions of Marine aviation in the war.⁶⁹ Major General Mudge summed it up well by saying:

The dive bombers of the 1st Marine Air Wing have kept the enemy on the run. They have kept him underground and enabled troops to move up with fewer casualties and greater speed. I cannot say enough in praise of these dive bomber pilots and their gunners and I am commending them through proper channels for the job they have done in giving my men close ground support in this operation.⁷⁰

Iwo Jima

The Battle of Iwo Jima continued application of many air support advances from the war (see Appendix D). The forces landed on 19 February 1945 and marked several firsts for Marine aviation, including the first use of an Air Support Control Unit (ASCU), predecessor of the Fire Support Coordination Center.⁷¹ The Command Ship initially controlled the airspace and transitioned to control ashore once forces established a sufficient beachhead.⁷² The unit controlled air from 1-15 March and provided “excellent liaison” with the Landing Force Headquarters, leading to accelerated air request processing and faster CAS missions. They also implemented a precursor of the Target Information Center to coordinate artillery with CAS for deconfliction. This resulted in very few instances in which artillery had to cease fire for low-level napalm air strikes. When two or more battalions fired on the same location, the ASCU used maximum ordinate control measures to keep aircraft above clear.⁷³ These precautions increased the effectiveness and safety of combined arms to the maximum extent possible at this stage of CAS development.

In spite of these successes, the CAS effort faced several problems on Iwo Jima. The small size of the island and its obliterated landscape presented few ground references for pilots,

and the Japanese defenders occupied small, well-camouflaged positions largely dug into the volcanic rock. With three divisions abreast on an extremely compressed battlefield, aircraft could only prosecute two airstrikes simultaneously, and then only if the targets occupied opposite sides of the battlefield. Finally, the thick volcanic crust on the island rendered general purpose bombs ineffective,⁷⁴ leading to the later use of the “Tiny Tim” rocket to penetrate hardened defenses. Emergency requests were almost routine in the harsh conditions of Iwo Jima combat, and resultant strikes reduced the required safety margins further. Captain John McJennett stated in his report on Air Support in the Pacific that “Although Iwo [Jima] was unsuited in almost every way for close air support, the weapon nevertheless scored heavily during the operation.” Most importantly, using the Landing Force Air Support Control Unit (LFASCU) to control all air on Iwo Jima was a monumental step toward complete Marine Air/Ground integration.⁷⁵ Iwo Jima demonstrated the soundness of CAS procedures as additional supervisory agencies supported the ALPs.

Other developments included strikes that were more consistently close than in other campaigns—often 200 and sometimes only 100 yards away from friendly lines. The challenging targets and terrain led to improvements in determining the appropriate weapon for each target. Previous campaigns had stopped artillery for air strikes, however on Iwo Jima artillery ceased only if two battalions were to fire at the same target scheduled for aircraft attack. Batteries individually ceased fire when aircraft entered their target area, and this measure resulted in no known aircraft casualties due to artillery. Finally, the operation proved that the ALPs needed better portable radios because their communication jeeps drew too much fire in the open with little to no available cover.⁷⁶ Iwo Jima confirmed the soundness of CAS doctrine based upon its contributions to the operation.⁷⁷

Okinawa

Air support operations on Okinawa represented the epitome of the new doctrinal FMF air-ground team (see Appendix E).⁷⁸ It was the first large-scale operation with Marine aviators providing CAS for Marine ground units since Bougainville, involving support from the Fast Carrier Task Force for the first few days until they flew off the carriers to land bases once airfields were secured.⁷⁹ One-tenth of Marine air assets numbering 700 aircraft operated under the overarching control of the Tactical Air Controller. Two subordinate LFASCU, with one attached to each corps, oversaw the lower echelons of controlling units, and they focused on maximizing preplanned missions to keep radio nets clear as possible. When required, the air liaison officers sent their ground commander's support requests by radio to their regimental air liaison officers, and division monitored the transmission with silence indicating consent. Overall ground units only requested 35 CAS missions with the remainder being preplanned.⁸⁰ According to Colonel Vernon Megee, Commander LFASCU, "Okinawa was the culmination of the development of air support doctrine in the Pacific. The procedures we used were the result of lessons learned in all preceding campaigns, including the Philippines."⁸¹

American forces faced little resistance and the Marines flew few CAS missions until 10 April when the 6th Marine Division hit significant resistance on the Motobu Peninsula in northwest Okinawa. LFASCU Number 1 moved their air control forward from the embarked Northern Attack Force ASCU as a result. Ground units requested few CAS missions from late-April on once forces secured the northern two thirds of the island. The 1st Marine Division then moved south on the right flank of the 10th Army, and later the 6th Marine Division and the 3rd Amphibious Corps joined them as well. Of the over 7,000 CAS missions, only three impacted

behind enemy lines.⁸² This reflected a significant safety improvement over the early operations in the Solomon Islands.

Pilots continued refining CAS tactics at Okinawa by employing napalm and rockets to great effect. Air liaison parties often called for napalm prior to rockets to remove camouflage and expose enemy positions, with the follow-on rockets effectively neutralizing fortified enemy positions.⁸³ Before rocket implementation, commanders used to call for artillery, naval gunfire support, and CAS in that order. With improved aircraft capabilities and better rocket accuracy and lethality, many commanders began requesting CAS first for appropriate targets, resulting in many lethal rocket attacks with this new weapon of choice.⁸⁴ Major George Axtell, commanding officer of the VMF-323 Death Rattlers flying F4U Corsairs, said half of his squadron's missions involved CAS for Army and Marine units using these tactics.⁸⁵ In order to increase their accuracy, they would make extremely low-level passes with bombs equipped with 10-second delay fuses, rockets, and napalm, often flying right through both enemy and friendly artillery and small arms fire. It was a risky business resulting in considerable aircraft damage and six pilots killed, but Axtel said that "These [CAS missions] were very important and were also very gratifying, as we received reports of the accuracy of the delivery of ordnance on targets and statements attesting to the effectiveness of these missions."⁸⁶ Okinawa was the most noteworthy operation for Corsair employment with their pinpoint attacks on enemy strongholds, and the aircraft became known as the "Sweetheart of Okinawa" to Americans and "Whistling Death" to the Japanese.⁸⁷

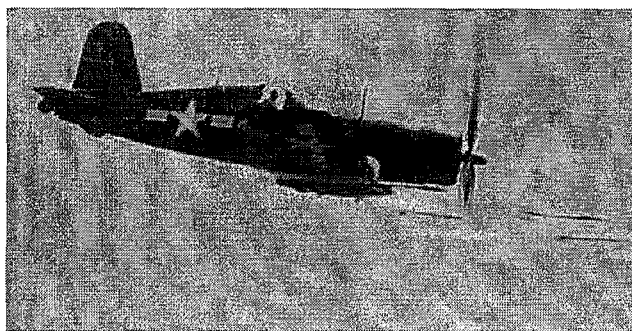


Figure 4. A Chance Vought F4U Corsair firing rockets at Okinawa, 1945. Source: Bluejacket, http://bluejacket.com/usmc/images/f4u_corsair_usmc.jpg

The Battle of Okinawa represented the pinnacle of Marine Corps CAS, but a new threat caused mission allocation to suffer. Significant air resources were reserved or diverted to counter the *Kamikazes* sent by an increasingly desperate Japan. American forces needed to have even more aircraft to adequately protect the Fleet while providing sufficient CAS.⁸⁸ As a result, only approximately twenty-percent of missions provided CAS.⁸⁹

Tactics continued to become safer and more effective in spite of this drain on resources, and air strikes became almost routine up to 100 yards from friendly forces.⁹⁰ Air liaison parties again made a significant impact attached to Army units, gaining superlative praise much like in the Philippines. The Commanding General of the 7th Infantry Division summed up Army sentiments by saying:

Division air support during this campaign was provided by Navy and Marine air forces and coordinated through air-ground liaison teams. Both attack and reconnaissance missions were very successful. Ground forces attacking with CAS were materially aided in taking enemy strongpoints and suffered no casualties from the front line air.⁹¹

The Battle of Okinawa was the final operation involving Marine Corps CAS before Japan's surrender, and it provided Marine Aviation their final opportunity to employ and refine their CAS tactics.

Lessons Learned

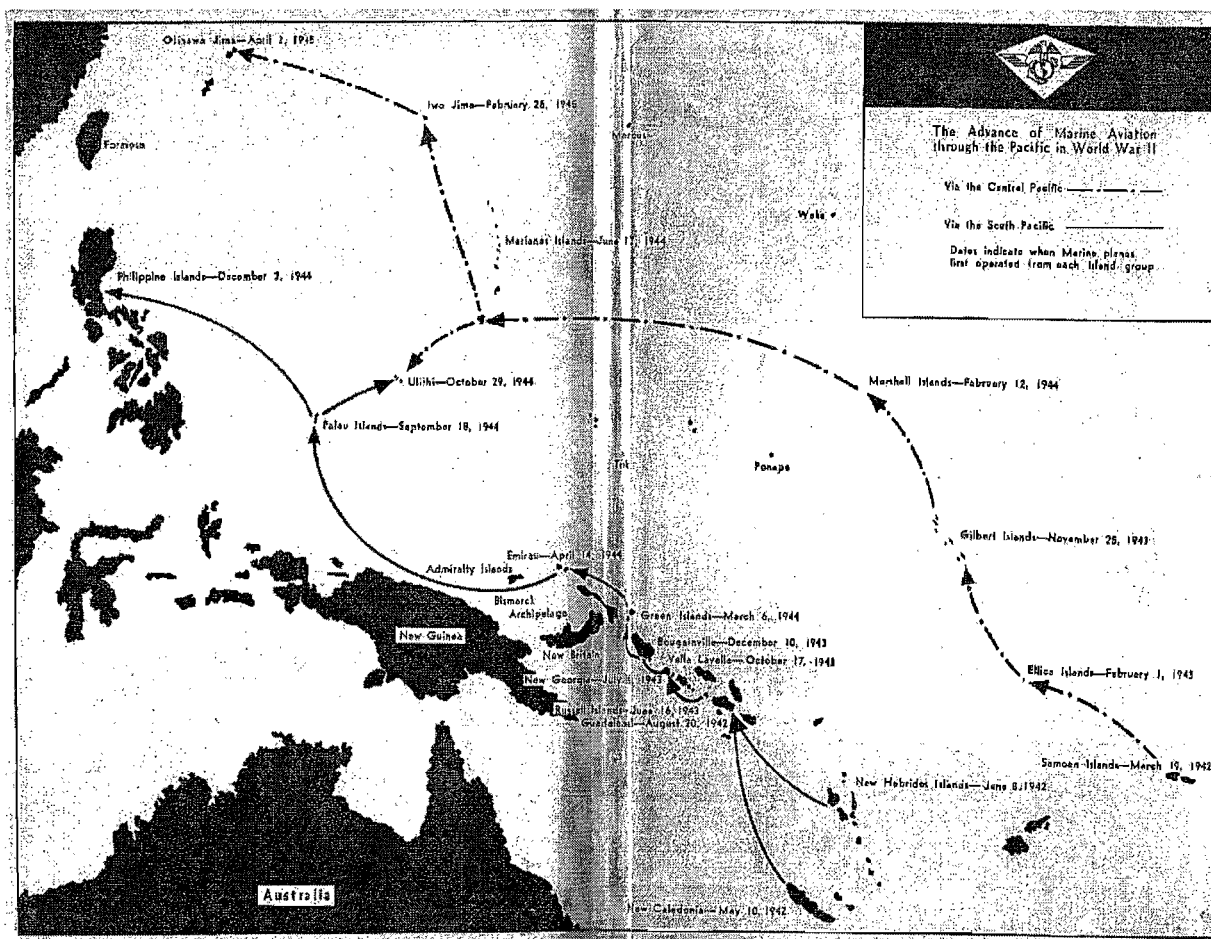
Lessons learned from the island-hopping campaigns ensured Marine Corps aviation's relevance following World War II. Comparing the two major late-war campaigns of the Philippines and Okinawa illuminates specific learning points. The Philippine campaign was much more fluid with ALPs directly controlling CAS. This worked well because air supported only one division at a time as they moved rapidly toward their objectives. Okinawa on the other hand involved up to four divisions abreast and was a much more static battle, requiring more coordination for safe deconfliction. The Marine Corps worked to integrate the flexibility enjoyed in the Philippines with the coordination required at Okinawa using the Fire Control Coordination Center. Marine Corps Landing Force Manual Number 8 published in 1946 accordingly defined CAS as "Air action against hostile surface targets which are so close to friendly forces as to require detailed integration of each air mission with the fire and movement of those forces." This solidified establishing ALPs, now known as tactical air control parties (TACPs), at each battalion, regiment and division with one or two pilots and a communication Marine. Ground commanders also realized that every target is a potential CAS target for future operations.⁹²

Conclusion

Marine Corps aviation came a long way from its inception to the end of World War II. Originally viewed as a novelty or a distraction by pessimistic ground personnel, it developed into an essential supporting arm within the FMF. The Army, Navy, and Marine Corps practiced dive bombing air support of troops early in World War II, but only the Marine Corps made the effort to truly integrate the aircraft with the ground commander using ALPs. The Marine Corps has repeatedly fought to justify its existence, and Marine aviation has done so as well to counter

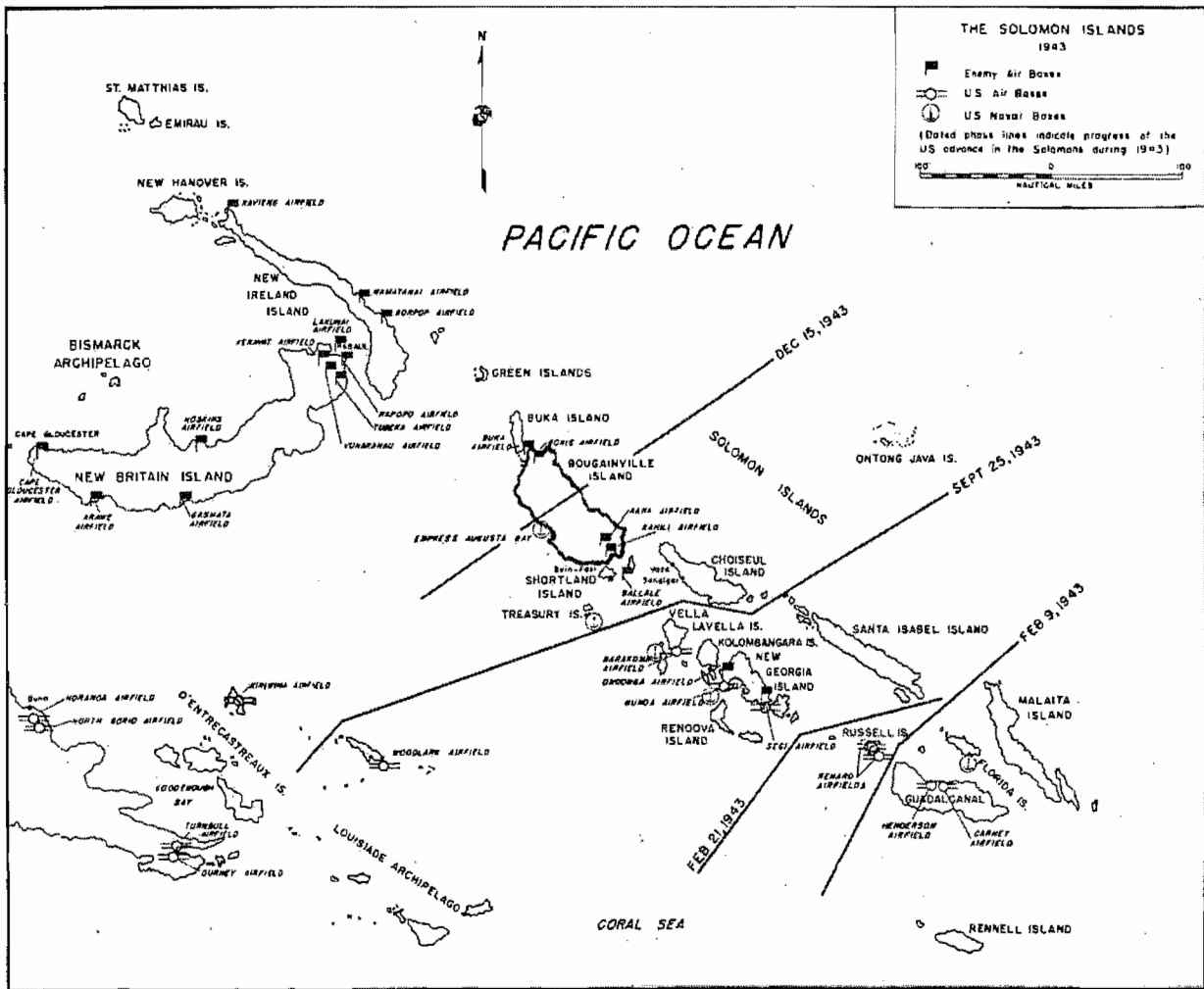
arguments against the need for its own air force. The tremendous impact of Marine CAS for both Army and Marine units coordinated by ALPs in the Pacific Theater proved definitively that this capability is essential to ground operations. Without direct control from ground commanders to their supporting aircraft, the CAS concept may have failed. All of those benefiting from air strikes on the ground can thank Marine Corps visionaries and early ALPs for their work in the Pacific Theater. Development of ALPs proved the most crucial factor for Marine air/ground integration during World War II.

Appendix A



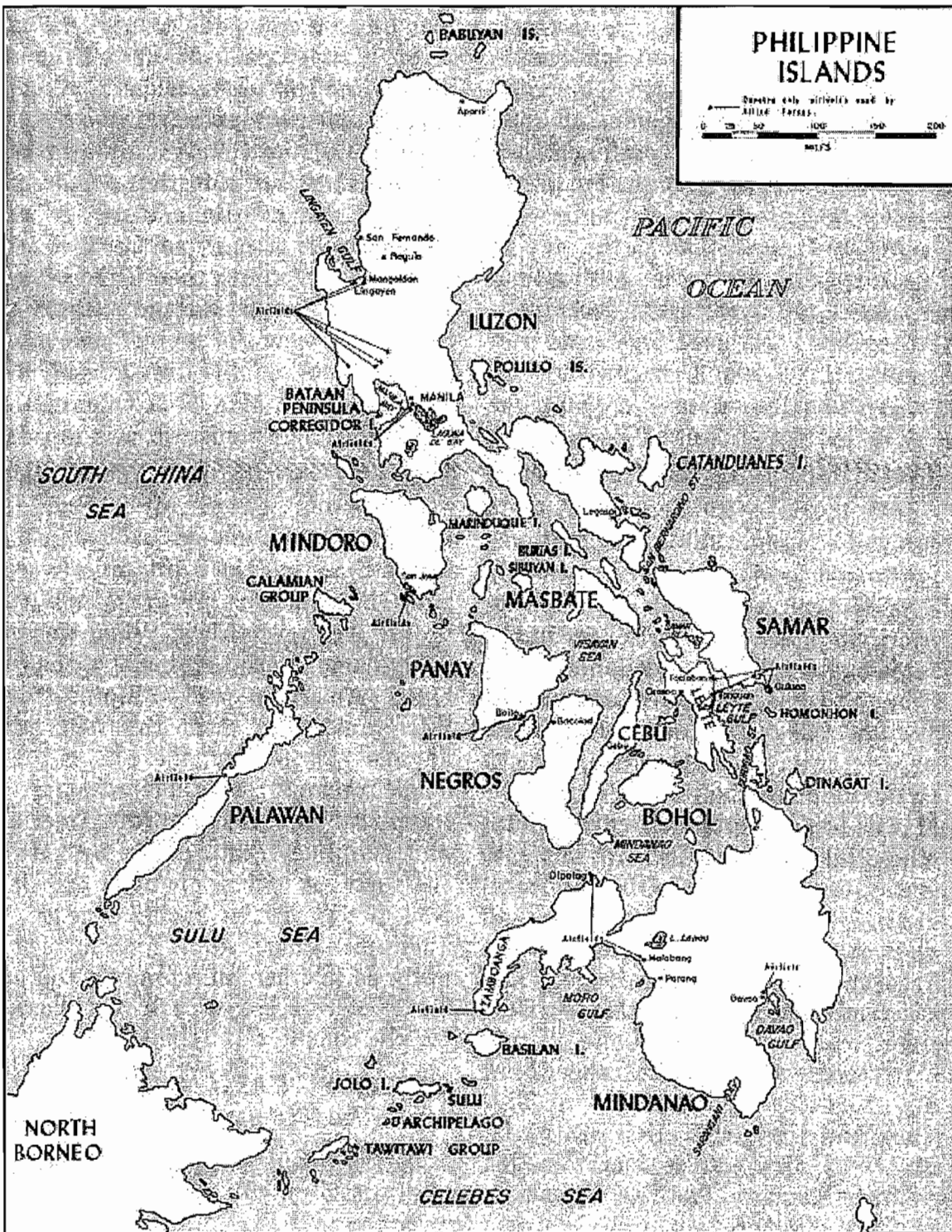
Source: De Chant, John A. *Devilbirds; The Story of United States Marine Corps Aviation in World War II*. 1st ed. New York: Harper, 1947.

Appendix B



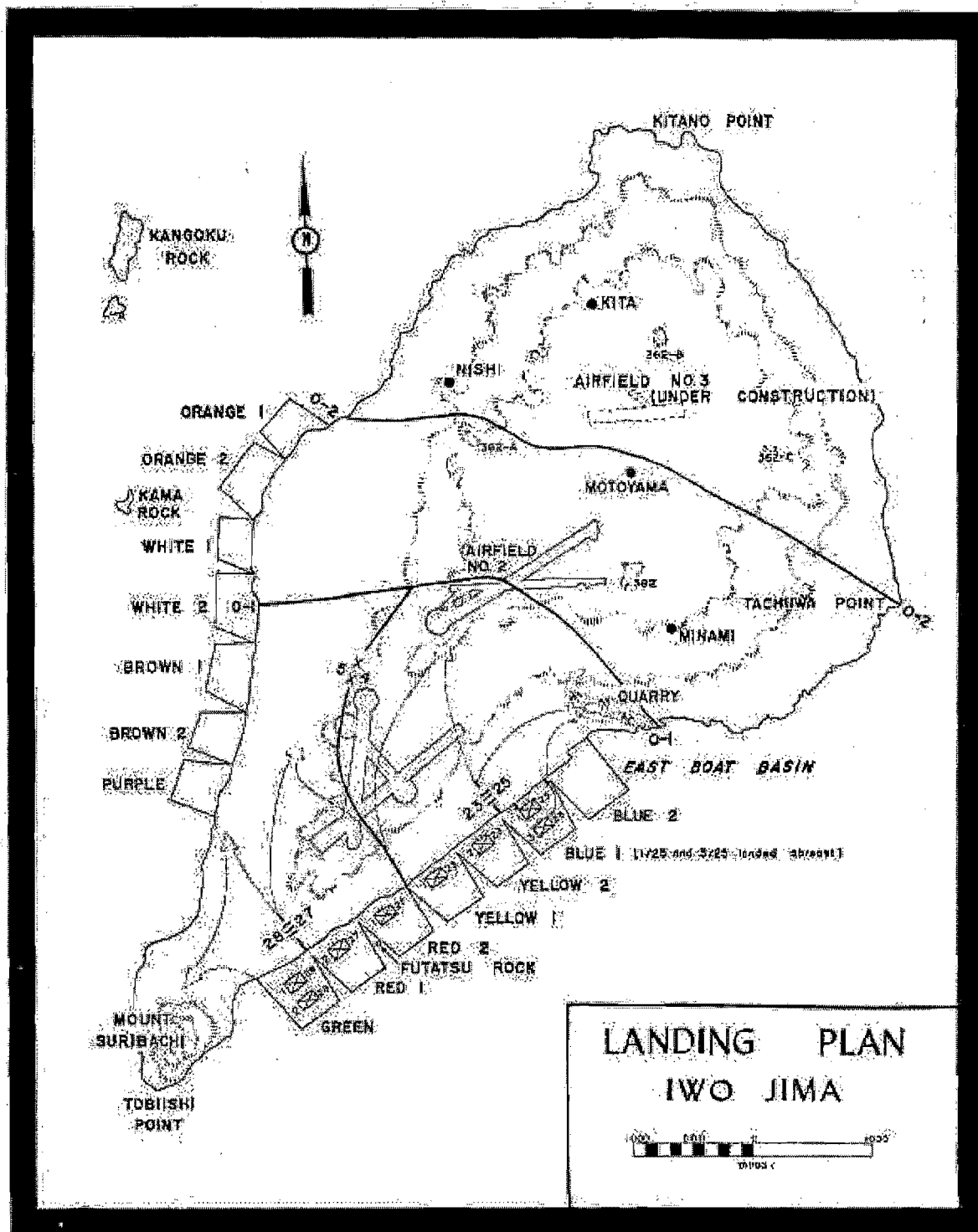
Source: Mersky, Peter B. *Time of the Aces: Marine Pilots in the Solomons*. Washington DC: Marine Corps Historical Center, 1993.

Appendix C



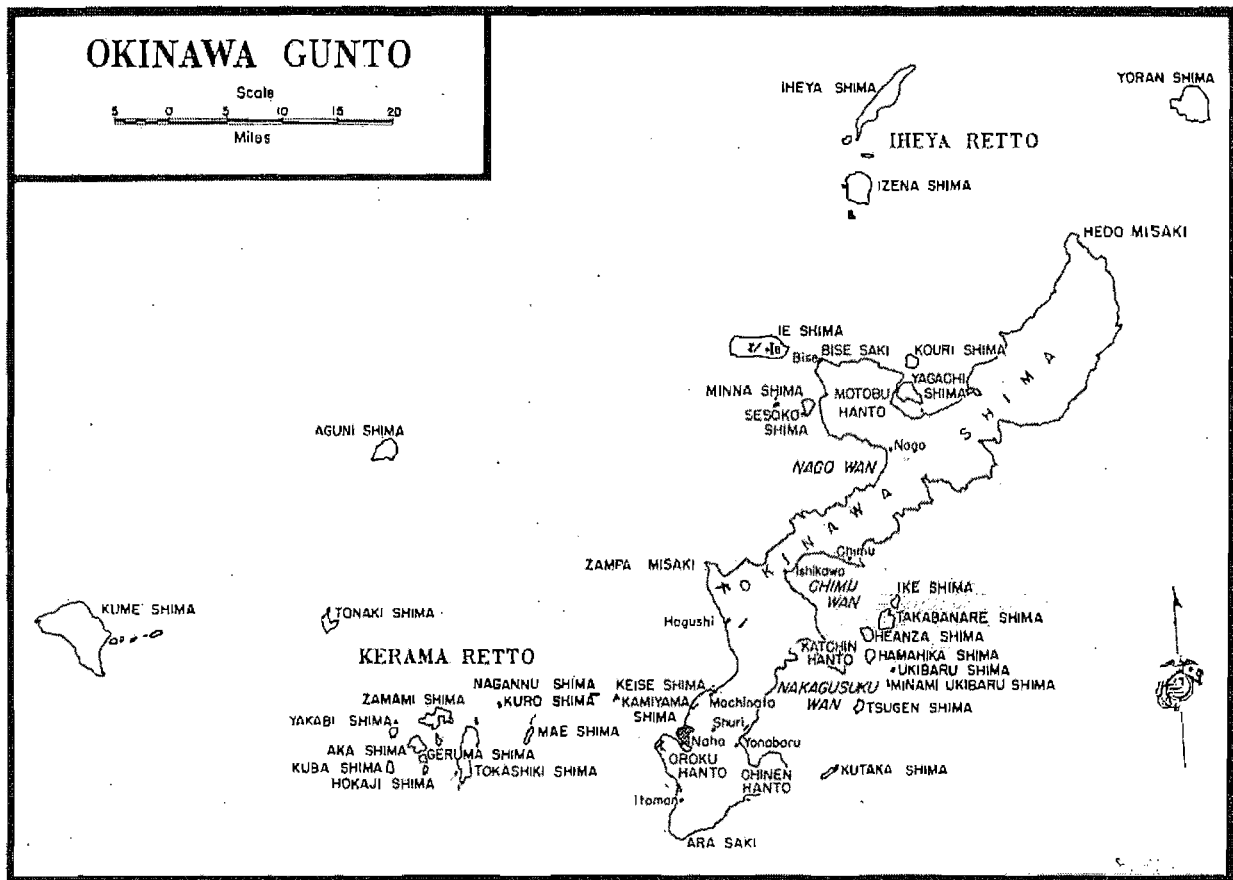
Source: <http://www.ibiblio.org/hyperwar/USMC/IV/maps/USMC-IV-16.jpg>

Appendix D



Source: <http://www.paperlessarchives.com/World War II Iwo Jima Landing Plan Map.jpg>

Appendix E



Source: Alexander, Joseph H. *The Final Campaign: Marines in the Victory on Okinawa*. Marines in World War II Commemorative Series. Washington, DC: Marine Corps Historical Center, 1996.

Glossary

ALP—Air Liaison Party

ASCU—Air Support Control Unit

CSA—Commander Support Aircraft

FSCC—Fire Support Coordination Center

JASCO—Joint Assault Signal Company

LFASCU—Landing Force Air Support Control Unit

MAW—Marine Aircraft Wing

SBD—Dauntless dive bomber

TACP—Tactical Air Control Party

TBF—Grumman Avenger torpedo bomber

Bibliography

- Alexander, Joseph H. *The Final Campaign: Marines in the Victory on Okinawa*. Marines in World War II Commemorative Series. Washington, DC: Marine Corps Historical Center, 1996.
- Astor, Gerald. *Semper Fi in the Sky: Marine Air Battles of World War II*. New York: Ballantine Books/Presidio Press, 2005.
- Boggs, Charles W. *Marine Aviation in the Philippines*. Historical Division Headquarters U. S. Marine Corps, 1951.
- _____. "Marine Aviation: Origin and Growth." *The Marine Corps Gazette* 34, no. 11 (November 1950): 68. <http://www.proquest.com/>.
- Caldwell, F. C. *Historical Data on Roles of Marine Corps Air Support (Fixed-Wing) in Selected Amphibious Operations*. Quantico: United States Marine Corps Historical Division, December 1968.
- Croizat, V. J. *Close Air Support Procedures in the War Against Japan*. Santa Monica: The Rand Corporation, 1967.
- Cunningham, Alfred A. "Value of Aviation to the Marine Corps." *The Marine Corps Gazette* 5, no. 3 (September 1920): 221. <http://www.proquest.com/>.
- De Chant, John A. *Devilbirds; The Story of United States Marine Corps Aviation in World War II*. 1st ed. New York: Harper, 1947.
- Johnson, Edward C., Graham A. Cosmas, and United States Marine Corps History and Museums Division. 1977. *Marine Corps Aviation: The Early Years, 1912-1940*. Washington: History and Museums Division, Headquarters, U.S. Marine Corps: for sale by the Supt. of Docs., U.S. Govt. Print. Off.
- Marine Corps Board Study. "Missions and Tasks of Marine Corps Aviation," 1950, United States Marine Corps History Division, Aviation: Close Air Support File 4.
- McCutcheon, Keith B. "Close Air Support on Luzon." *The Marine Corps Gazette* 29, no. 9 (September 1945): 38. <http://www.proquest.com/>.
- _____. "Close Air Support SOP." *The Marine Corps Gazette* 29 no. 8 (August 1945): 48. <http://www.proquest.com/>.
- McJennett, John. "Air Power for Infantry." *The Marine Corps Gazette* 29 no. 8 (August 1945): 14. <http://www.proquest.com/>.

- Mersky, Peter B. *Time of the Aces: Marine Pilots in the Solomons*. Washington DC: Marine Corps Historical Center, 1993.
- _____. *U.S. Marine Corps Aviation: 1912 to the Present*. Annapolis: Nautical and Aviation Publishing Company of America, 1983.
- Miller, Robert C. "Air Power in the Solomons." *The Marine Corps Gazette* 27 no. 1 (March/April 1943): 45. <http://www.proquest.com/>.
- Rowell, Ross E. Interview Transcript. September 24. Naval History Unit, Navy Department, 1946.
- Sherrod, Robert Lee. *History of Marine Corps Aviation in World War II*. Great War Stories. Baltimore: Nautical and Aviation Publishing Company of America, 1987.
- Smith, Peter Charles. *Close Air Support: An Illustrated History, 1914 to the Present*. 1st ed. New York: Orion Books, 1990.
- Sullivan, W. E. "History and Development of Close Air Support." *The Marine Corps Gazette* 40 no. 11 (November 1956): 20. <http://www.proquest.com/>.
- Tillman, Barrett. *The Dauntless Dive Bomber of World War Two*. Annapolis: Naval Institute Press, 1976.
- Rentz, John N. *Marines in the Central Solomons*. Washington DC: Historical Branch, Headquarters, U.S. Marine Corps, 1952.
- United States Marine Corps History Division, "[The Philippines] 26 January – 14 April, 1945," Aviation: Close Air Support folder 6: United States Marine Corps History Division.
- Unknown author. *Usefulness and Effectiveness of Close Air Support*. Aviation: Close Air Support folder 6: United States Marine Corps History Division.
- Vandegrift, Alexander. A. *An Evaluation of Air Operations Affecting the U. S. Marine Corps in World War II*. Quantico, VA: Marine Corps Schools, 1945.
- Wethe, W. G. "Marine Aviation in Support of Amphibious Troops." *The Marine Corps Gazette* 35 no. 1 (January 1951): 266. <http://www.proquest.com/>.
- Williams, Susan Mercer and Mirande, Frank J. *"When the Chips are Down . . ." A Historical Sketch of Close Air Support*. Lockheed Aeronautical Systems Company, 1988.

Endnotes

- ¹ Susan Mercer Williams and Frank J. Mirande, *"When the Chips are Down . . ." A Historical Sketch of Close Air Support* (Marietta, GA: Lockheed Aeronautical Systems Company, 1988), 1.
- ² Susan Mercer Williams and Frank J. Mirande, 2.
- ³ Peter Charles Smith, *Close Air Support: An Illustrated History, 1914 to the Present* (New York: Orion Books, 1990), 19.
- ⁴ Alfred Cunningham, "Value of Aviation to the Marine Corps," *The Marine Corps Gazette* 5, no. 3 (September 1920): 221. <http://www.proquest.com/>.
- ⁵ Cunningham, 221.
- ⁶ Robert Sherrod, *History of Marine Corps Aviation in World War II* (Baltimore: The Nautical and Aviation Publishing Company of America, 1987), 24-25.
- ⁷ Rowell, Ross E., interviewed by the Naval Aviation History Unit, 24 October 1946, Navy Department. Quoted in Robert Sherrod, *History of Marine Corps Aviation in World War II* (Baltimore: The Nautical and Aviation Publishing Company of America, 1987), 25.
- ⁸ Sherrod, 25.
- ⁹ Sherrod, 26.
- ¹⁰ Smith, 26.
- ¹¹ Edward C. Johnson, Graham A. Cosmas, and the United States Marine Corps History and Museums Division, *Marine Corps Aviation: The Early Years, 1912-1940*. (Washington DC: History and Museums Division, Headquarters, U.S. Marine Corps, 1977), 79.
- ¹² Cunningham, 221.
- ¹³ Cunningham, 221.
- ¹⁴ W. E. Sullivan, "History and Development of Close Air Support," *The Marine Corps Gazette* 40, no. 11 (November 1956): 20. <http://www.proquest.com/>.
- ¹⁵ Alexander. A. Vandegrift, *An Evaluation of Air Operations Affecting the U.S. Marine corps in World War II*. (Quantico: Marine Corps Schools, 1945), III-4.
- ¹⁶ Sullivan, 20.
- ¹⁷ V. J. Croizat, *Close Air Support Procedures in the War Against Japan*. (Santa Monica: The Rand Corporation, 1967), 138.
- ¹⁸ Vandegrift, III-5.
- ¹⁹ Sullivan, 20.
- ²⁰ Vandegrift, III-6.
- ²¹ Vandegrift, III-13 to III-15.
- ²² F. C. Caldwell, *Historical Data on Roles of Marine Corps Air Support (Fixed-Wing) in Selected Amphibious Operations*, (Quantico: United States Marine Corps Historical Division, December 1968), 3-4.
- ²³ Robert C. Miller, "Air Power in the Solomons," *The Marine Corps Gazette* 27, no. 1 (March/April 1943): 45. <http://www.proquest.com/>.
- ²⁴ Sullivan, 20.
- ²⁵ "Missions and Tasks of Marine Corps Aviation," 2 October 1950, Marine Corps Board Study, United States Marine Corps History Division, Aviation: Close Air Support, folder 4, 10.
- ²⁶ Vandegrift, III-16.
- ²⁷ Vandegrift, 1-36.
- ²⁸ Vandegrift, III-19.
- ²⁹ Sherrod, 150-151.

-
- ³⁰ Sullivan, 20.
- ³¹ Sherrod, 151.
- ³² John N. Rentz, *Marines in the Central Solomons*, (Washington DC: Historical Branch, Headquarters, U.S. Marine Corps, 1952), 158.
- ³³ Susan Mercer Williams and Frank J. Mirande, 1.
- ³⁴ Unnamed Author, *Usefulness and Effectiveness of Close Air Support*, United States Marine Corps History Division, Aviation: Close Air Support, folder 6.
- ³⁵ Vandegrift, 1-35.
- ³⁶ Sherrod, 189.
- ³⁷ Vandegrift, III-26 to III-27.
- ³⁸ Sullivan, 20.
- ³⁹ Croizat, 141-143.
- ⁴⁰ Croizat, 145.
- ⁴¹ Vandegrift, 1-27 to 1-28.
- ⁴² Croizat, 147-148.
- ⁴³ Sherrod, 189-190.
- ⁴⁴ Sherrod, 190.
- ⁴⁵ Sherrod, 191.
- ⁴⁶ Unnamed author, 3.
- ⁴⁷ Vandegrift, III-30 to III-31.
- ⁴⁸ Croizat, 155.
- ⁴⁹ Vandegrift, III-34 to III-35.
- ⁵⁰ Sherrod, 192.
- ⁵¹ Gerald Astor, *Semper Fi in the Sky* (New York: Ballantine Books/Presidio Press, 2005), 303.
- ⁵² Sullivan, 20.
- ⁵³ Astor, 305-306.
- ⁵⁴ Sullivan, 20.
- ⁵⁵ Astor, 303-304.
- ⁵⁶ Peter B. Mersky, *U.S. Marine Corps Aviation 1912-Present* (Annapolis: The Nautical and Aviation Publishing Company of America, 1983), 105.
- ⁵⁷ Keith B. McCutcheon, "Close Air Support SOP," *The Marine Corps Gazette* 29, no. 8 (August, 1945): 48. <http://www.proquest.com/>.
- ⁵⁸ Keith B. McCutcheon, "Close Air Support on Luzon," *The Marine Corps Gazette* 29, no. 9 (September, 1945): 38. <http://www.proquest.com/>.
- ⁵⁹ Astor, 312.
- ⁶⁰ McCutcheon, "Close Air Support on Luzon," 38.
- ⁶¹ Astor, 307-308.
- ⁶² "[The Philippines] 26 January – 14 April, 1945", United States Marine Corps History Division, Aviation: Close Air Support, folder 6.
- ⁶³ Smith, 115.
- ⁶⁴ Barrett Tillman, *The Dauntless Dive Bomber of World War II* (Annapolis: Naval Institute Press, 1976), 181.
- ⁶⁵ Tillman, 206-207.
- ⁶⁶ Mersky, 107.
- ⁶⁷ "[The Philippines] 26 January – 14 April, 1945."

-
- ⁶⁸ “[The Philippines] 26 January – 14 April, 1945.”
- ⁶⁹ Vandegrift, IV-1.
- ⁷⁰ “[The Philippines] 26 January – 14 April, 1945.”
- ⁷¹ Sullivan, 20.
- ⁷² “Missions and Tasks of Marine Corps Aviation”, 9.
- ⁷³ Vandegrift, III-80.
- ⁷⁴ John McJennett, “Air Power for Infantry,” *The Marine Corps Gazette* 29, no. 8 (August 1945): 14. <http://www.proquest.com/>.
- ⁷⁵ Croizat, 155-156.
- ⁷⁶ McJennett, 14.
- ⁷⁷ Vandegrift, III-82.
- ⁷⁸ “Missions and Tasks of Marine Corps Aviation”, 9.
- ⁷⁹ Caldwell, 9-10.
- ⁸⁰ Sullivan, 20.
- ⁸¹ Joseph Alexander, *The Final Campaign: Marines in the Victory on Okinawa* (Washington DC: Marine Corps Historical Center, 1996), 24.
- ⁸² Vandegrift, III-94 to III-96.
- ⁸³ Vandegrift, III-96 to III-97.
- ⁸⁴ Croizat, 144.
- ⁸⁵ Astor, 326-327.
- ⁸⁶ Astor, 334.
- ⁸⁷ Susan Mercer Williams and Frank J. Mirande, 47.
- ⁸⁸ W. G. Wethe, “Marine Aviation in Support of Amphibious Troops.” *The Marine Corps Gazette* 35, no. 1 (January 1951): 26. <http://www.proquest.com/>.
- ⁸⁹ Mersky, 116.
- ⁹⁰ Alexander, 24.
- ⁹¹ Vandegrift, III-98.
- ⁹² Sullivan, 20.