REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
04/21/2020	Master of Military Studies Research Paper	September 2019 - April 2020

4. TITLE AND SUBTITLE
German Airborne Operations in the Battle of Crete, 1941

5a. CONTRACT NUMBER
N/A

5b. GRANT NUMBER
N/A

5c. PROGRAM ELEMENT NUMBER
N/A

6. AUTHOR(S)
Wheatley, William G. Jr.

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

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

13. SUPPLEMENTARY NOTES
N/A

14. ABSTRACT

The German airborne assault on Crete was a strategic victory for the Axis and ensured the defense of their southern flank prior to Operation Barbarossa in Russia. Operationally however, as a stand-alone airborne assault, German success on Crete is questionable. The island of Crete in 1941 held substantial strategic value for both the British and Germans as a valuable air and naval base. Churchill and the British general staff perceived Crete as a key staging area for naval sea control of the Eastern Mediterranean while Hitler was concerned about the threat to German oil resources at Ploesti. In May of 1941, the German Luftwaffe conducted a joint forcible entry airborne operation to seize the island.

15. SUBJECT TERMS
Airborne Operations, Battle of Crete, Forcible Entry Operations, World War II German Airborne forces, Vertical Envelopment, Air Assault, Operation Merkur

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			USMC Command and Staff College
					19b. TELEPHONE NUMBER *(Include area code)*
Unclass	Unclass	Unclass	UU	32	(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, Virginia 22134-5068

MASTER OF MILITARY STUDIES

TITLE:

GERMAN AIRBORNE OPERATIONS IN THE BATTLE OF CRETE, 1941

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

AUTHOR:

Major William G. Wheatley
United States Marine Corps
AY 2019-20

Mentor and Oral Defense Committee Member: Dr. Paul Gelpi

Approved: //SIGNED//

Date: 12 April, 2020

Oral Defense Committee Member: Dr. Eric Shibuya

Approved: //SIGNED//

Date: 12 April, 2020

Executive Summary

Title: German Airborne Operations in the Battle of Crete, 1941

Author: Major William Wheatley, United States Marine Corps

Thesis: There are three "timeless" elements for vertical envelopment operations that appear in the German Airborne attack on Crete. Operation *Merkur* provides an excellent example of strategic calculus and risk weighed against objective. Additionally, the Germans debatable success on Crete highlights the operational imperative of supporting a lodgment, the criticality of tactical command and control, and the importance of communications for this maneuver.

Discussion: In 1941, Germany forcibly entered Crete with their largest airborne operation of the war. Operation *Merkur* was the brainchild of General Karl Student, the lead developer of the German airborne forces. Believing that he could leverage German air superiority in the Mediterranean, Student sought to surprise the allies on Crete and overwhelm them with the capture of an airhead and rapid reinforcement by both air and sea. In this he was only partly successful. Indeed, the costly German victory came more as a result of the uncoordinated allied defense than it did to the surprise, shock, and speed of the airborne forces. Ultimately, Germany's airborne capability was expended early in the war to protect the strategically valuable energy resources at Ploesti. Today, United States Military Joint Doctrine holds that a vertical envelopment is still a viable option in an Anti-Access Area Denial (A2/AD) environment against a peer or near-peer adversary. This paper seeks to inform that assumption. While none of these arguments are necessarily new they have several important theoretical and practical implications. First, the lessons learned from a study of Operation *Merkur* contribute to an understanding of the genesis and development of the offensive conduct of airborne operations in particular and of forcible entry operations in general. Secondly, this study contributes to the growing body of work focused on planning and executing such operations. Third, past and present engagements from military history frequently portray underlying similarities.

Conclusion: Strategically, Operation *Merkur* was successful in achieving Hitler's objective of protecting the energy resources of Ploesti as Operation *Barbarossa* kicked off. Germany, however, would never again launch a large airborne attack due to the heavy casualties in men and equipment suffered on Crete. Operationally and tactically, the limitations of a vertical envelopment and its reliance upon multi-domain superiority are apparent. Modern-day commanders would be well advised to take note of the significant risks associated with the vertical envelopment maneuver against a peer or near-peer adversary.

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.

TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY……....2

DISCLAIMER……3

PREFACE……...5

INTRODUCTION……...6

SOURCES……...7

STRATEGIC VALUE OF CRETE…….....8

GERMAN PLANNING FOR OPERATION *MERKUR*……..11

GERMAN AIRBORNE FORCES IN WORLD WAR II…….....17

THE BATTLE OF CRETE……...19

OBSERVATIONS FOR FORCIBLE ENTRY OPERATIONS……25

CONCLUSION…….....26

APPENDIX A, EASTERN MEDITERRANEAN THEATRE, 1941……...32

APPENDIX B, OPERATION *MERKUR* AIRBORNE PLAN, 20 MAY 1941……33

APPENDIX C, THE FIGHT FOR SEA CONTROL AROUND CRETE, 1941……..34

APPENDIX D, MALEME AIRFIELD 21 MAY 1941…….35

BIBLIOGRAPHY……..36

PREFACE

I have always had a professional interest in heliborne and airborne assaults, but my interest in Operation *Merkur,* Germany's successful invasion of Crete in 1941, developed as a result of studying the Anti-Access Area Denial (A2AD) problem. The list of historical examples of forcible entry operations by air is short. What particularly piqued my interest with Crete was the German lack of sea control in the Mediterranean theatre, similar to today's Indo-Pacific problem set that planners struggle with. The Germans overcame their problem with air superiority, a favored domain of today's military planners.

Despite limited resources, Operation *Merkur* was a significant tactical success for the German *Luftwaffe.* Were there "timeless" elements, lessons that, perhaps, could be learned and applied to the modern day? With further research, it became apparent that, while the Allied defense of Crete is heavily documented, few sources focus on German operations. Of these few sources, even fewer recognize the British Royal Navy's loss of sea control that occurred as a result of this engagement. Reviewing these sources leads to a better understanding of the operational missteps – on both sides – and the strategic ramifications. It is my hope that the lessons gleaned from these may be valuable as well.

I would like to thank Dr. Paul Gelpi for his time in assisting and guiding me in the development and completion of this thesis and the thought-provoking conversations it has generated. Additionally, the recommendations and critiques of Ms. Andrea Hamlen-Ridgley at the Learning and Resource Center proved invaluable in constructing and critiquing this paper.

Lastly I would like to thank my family, especially my wife Monika, for her amazing support and my children, Emma and William, for their understanding on those days when I remained "chained" to the proverbial desk.

INTRODUCTION

The Battle of Crete, 1941, provides an excellent example for the study of what the modern day U.S. Military terms, "forcible entry operations."[1] Forcible entry operations are complex, and risky, and they require detailed planning, coordination, and cooperation and communication among all participants. In 1941, Germany forcibly entered Crete with the largest airborne operation they had ever undertaken. Today, United States Military Joint Doctrine holds that a vertical envelopment is still a viable option in an A2/AD environment against a peer or near-peer adversary, assuming one can accept the risks. This paper seeks to inform that assumption and highlights three "timeless" elements. First is the strategic calculus of employing a vertical envelopment while weighing the risk against the desired strategic outcome. Second is the operational necessity of logistically supporting a lodgment once it is established. Third is the tactical communication requirement necessary for command and control. These elements seem simple and obvious at first glance but frequently are overlooked during planning. In sum, they speak to the imperative of multi-domain superiority.

SOURCES

Before diving into an examination of the Mediterranean Theatre of 1941 a brief synopsis of the available historical resources on the Battle of Crete is necessary. The majority of work is written about the allied defense of the island with minimal attention given to the Germans.[2] D. M. Davin's *The Official History of New Zealand in the Second World War* is the most frequently cited in histories after the 1950's and is particularly useful for the terrain charts it includes. Generally, allied works portray the defenders as under-resourced, their adversary as highly

[1] US Department of Defense, *Joint Forcible Entry Operations,* Joint Publication 3-18, May 11,(Washington, D.C. 2017) I-1. A vertical envelopment describes either an airborne assault by paratroopers, an air assault by fixed wing, rotor or tilt-rotor aircraft, or a combination thereof.

[2] These books reference accounts published by General Freyberg, Prime Minister Winston Churchill, General Wavell, and General Kippenberger.

experienced, and express consternation at the failure to capitalize on the high fidelity of ULTRA intelligence intercepts.[3] Most assume sea control by the British Royal Navy as a given throughout the battle or otherwise fail to recognize the significance of the sea domain.[4] Some works are rife with minor factual errors.[5] The most valuable military examination of the allied defense is Albert Palazzo's, *Battle of Crete* from the Australian Army History Unit.[6]

Stand-alone studies focused on German operations are few. There is a growing body of work from the U.S. Army Command and General Staff College that examines the subject either in part, such as Stephen Kavanaugh's study of Malta, or in detail like, Maria Biank's *Battle of Crete* research.[7] Allen Morris's *Kreta Als Beispiel* is an excellent and thorough rendition of the battle, however, its conclusions are focused on the importance of using a single airhead and are debatable.[8] Additional works, such as *Storming Eagles* by James Lucas, focus specifically on the German airborne forces and only mention Crete in passing.[9]

Primary German sources are not readily available. The key documents are the XI and VIII Air Corps battle reports. Second-hand access to the information from these reports, as well as correspondence with surviving German officers present at the battle, can be found in Ian

---

[3] See Antill, Beevor, Palazzo, Stewart, and Corum as listed in the bibliography. Mention of ULTRA, however, is only found in work published after it was declassified in 1970. Allied sources published prior to this speculate on intelligence sources, while German sources search for all manner of reasons from camouflaged fishing boats to eavesdropping waiters to account for the lack of surprise.

[4] David Thomas, *Nazi Victory: Crete 1941* (New York, NY: Stein and Day Pub. 1972) is an exception to this.

[5] Peter D. Antill, *Crete 1941: Germany's Lightning Airborne Assault* (Oxford: Osprey, 2005), 24-25, 217. Peter Antill's work has facts that are contradictory (force size) and occasionally erroneous or confusing (Matilda tank variants).

[6] Albert Palazzo, *Battle of Crete,* (Canberra, Australian Army History Unit, 2007).

[7] Maria Biank, *The Battle of Crete: Hitler's Airborne Gamble (*Fort Leavenworth, KS: Army Staff College, 2003); Stephen Kavanaugh, *Hitler's Malta Option: A Comparison of the Invasion of Crete (Operation Merkur) and the Proposed Invasion of Malta (Operation Hercules),* (Fort Leavenworth, KS: Army Staff College, 2006).

[8] Allen Morris, *Kreta Als Beispiel: German Airlift During the Battle of Crete*, (Fort Leavenworth: KS, Army Staff College, 2014). Morris has perhaps the most up-to-date and comprehensive review of historiography on the subject.

[9] James Lucas, *Storming Eagles: German Airborne Forces in World War II* (Sanford, ME: Edison Press, 2004), 11.

Stewart's, *The Struggle for Crete*.[10] Additionally, the reports are referenced by D. W. Pissin and Fritz Morzik in two separate post-war documents archived by the United States Air Force in their Historical Research Agency at Maxwell Air Force Base.[11] Lastly, *Crete The Battle for Heraklion: The Campaign Revealed through Allied and Axis Accounts* by Yannis Prekatsounakis, provides a readily available source for diary entries and letters from German paratroopers and allied defenders.[12]

All told, the best historical works to reference are Stewart and Morris because they combine the largest number of primary sources and provide a pre and post-ULTRA study. George Forty's well-rounded work, *Battle of Crete*, is another accurate and up-to-date source, which is particularly well resourced with maps.[13] As previously mentioned Palazzo from the Australian Army provides an excellent case study of the allied defense. With these sources in mind, let us move on to examine the operation area of Crete as it existed in 1941.

STRATEGIC VALUE OF CRETE

The Mediterranean theatre in 1941 was a complex and dynamic littoral environment. British sea control was counter-balanced by German air superiority. Both sides sought to control key terrain in support of their strategic interests. In the spring of 1941 the Island of Crete became of strategic importance to the Germans as they sought to wrap up their campaign in

---

[10] Ian Stewart, *The Struggle for Crete, 20 May – 1 June 1941: A Story of Lost Opportunity* (Oxford, London: Oxford University Press, 1966). Stewart was a medical officer for the 1st Welsh during the battle. While he demonstrates good historical practices in his research and writing he has two biases. The first is a healthy disgust for the allied defensive measures. The second is a naïve acceptance of information via correspondence with Major General Walter Gericke, a German Captain during the battle, as indisputable fact.

[11] See D.W. Pissin, *Numbered Air Force Study 162,* "The Battle of Crete," (Maxwell AFB, AL: Air Force Historical Research Agency, 1956) and D. Fritz Morzik, *Numbered Air Force Study 167,* "German Air Force Airlift Operations," (Maxwell AFB, AL: Air Force Historical Research Agency, 1961). Pissin's work is the more relevant of the two. The author was a paratrooper who participated in the battle. He very clearly marks his own input and renders the rest of the work based on the official reports. Morzik was a Junker pilot throughout the war, and he touches only briefly on Crete.

[12] Yannis Prekatsounakis, *Crete: The Battle for Heraklion 1941: The Campaign Revealed Through Allied and Axis Accounts,* (Tarxien, Malta 2016).

[13] George Forty, *Battle of Crete*, (Hersham, Surrey 2001).

Greece and secure their southern flank. Hitler saw potential for the island as a base to extend air superiority over the eastern Mediterranean, but more importantly for its strategic value as a key defense of the vital Romanian oil fields, "Nothing was more vital to him than oil."[14] Conversely, British Prime Minister Winston Churchill perceived the importance of Crete as an allied naval base enabling offensive operations against Germany's southern flank and defending British supply lines to Egypt.[15] To secure the island in support of their broader strategic goals, the Germans decided on an airborne assault. Following the destruction of much of the Italian battle fleet in March, 1941, the Axis lacked sufficient surface vessels to ensure local sea control for an amphibious option. Additionally, the manpower constraints created by preparations for Operation *Barbarossa* precluded the diversion of resources or troops from the Werhmacht.[16] These limitations enabled the *Luftwaffe* commander, General Goring, to convince Hitler to conduct an airborne option to seize Crete and complete the conquest of Greece.[17]

Airborne and Air Assault operations are modern day tactics that planners have in their "toolbox" for employment during forcible entry operations.[18] The *National Defense Authorization Act for Fiscal Year 2019* (NDAA) directed the Secretary of Defense to assess whether forcible entry operations by the Joint Force should remain an enduring mission.[19] In the increasingly complex modern-day littoral environment, with adversary A2/AD defensive postures, vertical envelopment operations require detailed consideration. The forcible entry

[14] Beevor, *Crete: The Battle and the Resistance* (London, 2015), 76; Stewart, *The Struggle for Crete,* 5-6.
[15] Martin Gilbert, Winston S. Churchill, Vol. VI: Finest Hour, 1939-1941 (Boston: Houghton Mifflin, 1983), 1072-1076; Beevor, *Crete*, xv; Stewart, *The Struggle for Crete,* 26-27.
[16] Operation *Barbarossa* was meant to be Hitler's master stroke to create *lebensraum* to the East by invading the Soviet Union, and it focused almost all German resources on the Eastern front.
[17] Goring had fallen out of favor with Hitler following the failure of the *Luftwaffe* to defeat Britain and the cancelation of Operation *Sea Lion*: the planned German invasion of Britain across the English Channel. Additionally, General Student, the commander of all German airborne forces, was eager to prove the blitzkrieg potential of airborne warfare.
[18] Other methods include Amphibious Assault, Amphibious Raids, and Special Operations.
[19] Senate Committee on Armed Services, ''John S. McCain National Defense Authorization Act for Fiscal Year 2019'' (Washington, D.C. 2019), 346-347.

problem that the Germans faced at Crete in 1941 is similar to the problem set that exists in the first and second island chains of the Indo/Pacific theatre today. A study of German operations in the use of airborne forces at Crete therefore can inform modern day airborne and air assault operations.[20]

The German airborne assault on Crete was a strategic victory for the Axis and ensured the defense of their southern flank. Operationally however, as a stand-alone airborne assault, German success on Crete is questionable. The German victory on the island is perhaps best described as "Pyrrhic." Hitler is often quoted as saying, "The day of the paratrooper is over." and Student himself wrote, "Crete was the graveyard of the German Airborne Division."[21]

The island of Crete in 1941 held substantial strategic value for both the British and Germans as a valuable air and naval base. The cancelation of Operation *Sea Lion* necessitated a change in German strategy, and Hitler turned towards attacking British power in the Mediterranean in an attempt to pressure Churchill into giving up.[22] Some members of the German general staff hoped to convince Hitler to use Crete as a base for controlling the Eastern Mediterranean and conducting follow-on operations in the Middle East in concert with their "periphery strategy."[23] Ultimately, a change in the timeline for the invasion of the Soviet Union caused Hitler to curtail efforts in the Mediterranean theatre. Regardless, it was vitally important to deny Crete to the British in order to protect Germany's energy resources at Ploesti, Romania.

[20] Historiographical note: An excellent case study with lessons learned following the Allied defense of Crete can be found in Albert Palazzo, *Battle of Crete*.
[21] Stewart, *The Struggle for Crete,* 476-478.
[22] Ibid., 2-9; Thomas, *Nazi Victory: Crete 1941,* 22.
[23] Historians are divided. One argument is that Hitler did embrace this strategy of applying pressure on the periphery of the British Empire to cause collapse and was, perhaps, nearing success when Stalin's demands in the Balkans forced Hitler to accelerate preparations for war with the Soviets. Others argue that Hitler always intended to attack Russia, and that it was Italy's failing efforts in Greece and Africa that necessitated military action to defend Ploesti's energy supply.

Conversely, Churchill and the British general staff perceived Crete as a key staging area for naval sea control of the Eastern Mediterranean.[24] They hoped to build up air bases on the island in order to launch air strikes against strategic targets in Axis territory. Additionally, the Royal Navy hoped to use Crete as a resupply harbor in the eastern Mediterranean to reduce the logistical constraint of withdrawing ships out of theatre to Alexandria for resupply.[25] While undoubtedly a worthy goal, the British had limited resources to realize Churchill's dream of a "second Scapa" at Suda Bay.[26] Indeed, the limited number of aircraft that the Royal Air Force deployed on Crete, and the night raids they launched on the mainland only further convinced the Germans of the threat posed by British control of the island. The increased allied naval traffic through the harbor at Suda Bay, and the threat to Axis logistical shipping, both along the northern Mediterranean coast and south to Africa, could not go unchallenged. For Hitler though it was always the strategic necessity of ensuring the energy supply at Ploesti that made Crete's occupation by German forces an imperative.[27]

GERMAN PLANNING FOR OPERATION *MERKUR*

Modern day operations planning within the United States military frequently explore vertical envelopment options for forcible entry operations. The vertical envelopment is a dazzling tactic that displays speed, maneuver, and shock. It attacks gaps and vulnerabilities instead of surfaces, encourages asymmetric thinking, and takes advantage of superiority in the air domain. In 1941, German General Kurt Student sought an opportunity to demonstrate the

[24] Stewart, *The Struggle for Crete,* 26-30. Prime Minister Winston Churchill had previously been head of the British Admiralty. During his tenure he fortified and expanded the British Naval Base at Scapa Flow.
[25] Thomas, *Nazi Victory,* 112.
[26] Gilbert, *Finest Hour,* 1065; Thomas, *Nazi Victory*, 111; Stewart, *The Struggle for Crete,* 27.
[27] Stewart, *The Struggle for Crete,* 5-6. "Hitler realized…that if the British should now be invited to Greece their aircraft would be able to threaten the Rumanian oil refineries at Ploesti. Nothing was more vital to him than oil."

hallmarks of *blietzkrieg* with just such a maneuver at Crete.[28] Student had pioneered airborne warfare in Germany during the 1930's. He had worked hard to organize, man, train, and equip the new paratrooper forces and to refine their doctrine.[29]

Student had been recuperating from wounds he received during airborne operations in the Netherlands and had used the time to refine his approach to airborne operations. This was fortunate. Due to the dynamic nature of the German campaign in Greece there was very little time to plan or prepare for what was named Operation *Merkur*. Initial planning for the operation commenced on 20 April, thirty days prior to execution. Planning was led by Student and Air Marshal Wolfram von Richthofen.[30] Von Richthofen, with his VIII Fliegerkorps would be the air commander, and Student, with the XI Fliegerkorps, was the airborne assault commander.[31] They both reported to General Alexander Lohr, commander of 4th Air Fleet.[32] Both commanders presented their initial, separate, plans to Lohr who returned them with guidance to refine them into a final melded plan. Additionally, a naval component of the Kriegsmarine was added to provide logistical support and landing of heavy equipment.

Student's initial plan called for no less than seven landing zones and focused on taking down all the key objectives on the island simultaneously.[33] Richthofen's plan focused on a single landing site at the airfield in Heraklion. Richthofen was very critical of Student's initial

---

[28] James S. Corum, *Wolfram von Richthofen: Master of the German Air War,* (Leavenworth, KS, University Press, 2008), 249.
[29] Lucas, *Storming Eagles,* 11.
[30] Corum, *Wolfram von Richthofen*. Marshal Wolfram von Richthofen was a brilliant tactical and operational commander within the *Luftwaffe.* A cousin of World War I's famous "Red Baron" von Richthofen, he was personally involved in the development of the Me 109 fighter and He 111 bomber and the development of close air support. Like Goring, he was in political disfavor with Hitler for his failure to win the Battle of Britain.
[31] Ibid., 250. Student argued that the operation should have one overall commander (him), but he was opposed; German standard command system called for separate air and ground commanders. Indeed, Crete is an excellent example of a Joint operation that involved the three German components for Air, Land, and Sea. Lohr was in essence a Joint Force Commander.
[32] Morris, *Kreta Als Beispiel*, 46-49. General Alexander Lohr had previously been an officer in the Austrian Air Force before Austria was forcibly assimilated into Germany.
[33] Stewart, *The Struggle for Crete,* 87; Antill, *Crete 1941,* 32-33.

plan.[34] As the air commander he was responsible for providing supporting fires to the ground force in the form of close air support. Multiple landing sites and distant airfields made it difficult to accomplish the necessary massed effect of fires. Additionally, he argued, a single landing site would enable unity of effort, with reinforcement and sustainment possible via follow-on forces. Due to this concern, Student's initial plan was re-drawn to focus on three different landings in the vicinity of the three main airfields on Crete: Meleme, Retimo, and Heraklion.[35]

The final German plan called for two waves, the limitation being insufficient air transport to lift all the forces in one wave.[36] These two waves would be divided into three groups. Group West, wave one, would secure Maleme airfield. Group Center, first and second wave, would focus on Suda Bay (first) and Retimo airfield (second). Group East, also second wave, would strike Heraklion. The first wave, led by the special assault *Sturmregiment* in gliders, would focus on the air defense implacements near the airfield at Maleme and seize Prison Valley as a headquarters. The second wave would drop paratroopers near Suda Bay and the airfields at Retimo and Heraklion. Each wave would be closely preceded by Richthofen's fighter-bombers to suppress enemy defenses, particularly the identified anti-aircraft positions. Fighter aircraft would escort the waves to their drop zones, and additional sorties of fighter-bombers would follow to provide the paratroopers with close air support post-drop. An amphibious landing

[34] Ibid. "Student plans his operations based on pure suppositions and preconceived notions." See also E.R. Hooten, *Eagle in Flames: The Fall of the Luftwaffe* (London: Arms and Armour Press, 1997), 78.

[35] Stewart, *The Struggle for Crete,* 87-89. This plan created a dilemma for the defenders. The threat of a vertical envelopment at any one of the three airfields prevented mutually supporting defensive positions. Whether this was Student's intent or not is difficult to determine. What is certain is that Student did not know that British intelligence was intercepting and decrypting *Luftwaffe* communications and that the British force was expecting an airborne *and* amphibious assault and had divided its force up in an attempt to defend against all possibilities.

[36] Pissin, "The Battle of Crete," 50; Forty, *Battle of Crete,* 48; Morris, *Kreta Als Beispiel, 36*. German planners estimated no more than 6,000 per wave. A single JU-52 could carry up to 12 combat-loaded paratroopers or 18 air assault troops. Estimates vary, but Student appears to have had 502 JU-52's on hand, implying a maximum lift of 6,024 at 100% aircraft readiness. On 20 May, 1941, 493 JU-52's successfully launched for the first wave. Pissin,171. See also Morris, 94.

force was also added in order to transport a mechanized force, artillery, supplies, and a regiment of infantry.

The supporting effort provided by the amphibious force was important. The theory was that the paratroopers would seize an airhead and port facility. Student assumed that his paratroopers would seize more than one airfield. He planned primarily to use the airfield at Heraklion for the airhead, it had the longest runway and was paved, in line with Richthofen's original plan. However, he was prepared to reinforce whichever airfield was seized first. As additional reinforcements were brought in via air to stabilize and expand the airhead, the amphibious force would land and provide an offensive, mechanized capability with its own organic fire support. To conduct the amphibious landing, the Germans would need local sea control on the northwestern side of Crete. Since they had no naval force of their own available, and the Italian battle fleet had been sunk earlier in the year, they were relying on air superiority to trump British sea control.[37] Von Richthofen's VIII Fliegerkorps had considerable experience in anti-ship operations from the Battle of Britain. The Corps had seven *Geschwader*, or groups, of which three were experienced Stuka dive-bombers capable of challenging the Royal Navy.[38] They had driven the Royal Navy away from the southeastern coast of Britain in 1940 while fighting off British Spitfires and had every expectation of being successful in the Mediterranean where they enjoyed air superiority by default. Richthofen stepped up anti-ship operations in the latter half of April, sinking more than 113 ships, some 360,000 tons of allied shipping.[39]

---

[37] Forty, *Battle of Crete,* 18. The Battle of Matapan and destruction of much of the Italian battle fleet in March had solidified British sea control.

[38] Corum, *Wolfrum von Richthofen,* 228; Antill, *Crete 1941,* 31; Stewart, *The Struggle for Crete,* 79. The Junkers JU-87 "Stuka" dive-bomber was capable of delivering a 1,100 lb bomb that could sink merchant vessels and naval destroyers with a single hit. German dive-bomber pilots had perfected precise (by 1940 standards) delivery tactics using an 80 degree dive angle that pulled up for delivery at 2000 feet. Unique automatic dive brakes ensured recovery from the dive despite the severe g-forces experienced by the pilot. VIII Air Corps had 150 Stukas at the beginning of the operation.

[39] Corum, *Wolfram von Richthofen,* 249.

Additionally, his air support plan for *Merkur* called for increasingly heavy bombing missions on allied air defenses and of ships at harbor in Suda Bay and for reconnaissance of allied positions on Crete and the future landing zones.

In summary, at this stage the German plan required air superiority, local sea control, amphibious shipping, a port of assembly, and sufficient airfields, aircraft, and logistical support to sustain intensive air operations for several weeks. Close timing was essential to provide the join-up of escorts with the assault force and synchronize the landings with the pre-landing air strikes. This timing was reliant upon communication between Richthofen's VIII Air Corps headquarters and Student's XI Fliegerkorps. Additionally, tactical communication between the paratroopers and the aircraft overhead during execution would be essential to provide the deadly combination of close air support fires and rapid ground force advance.

In an effort to maintain air superiority, facilitate local sea control, and maximize supporting fires, the VIII Air Corps immediately began planning and began preparing additional airfields for attack aircraft in the Peloponnesian and Aegean islands. These airfields would reduce aircraft response time and increase on-station time for close air support and anti-ship missions by VIII Air Corps aircraft.

This expeditionary airfield construction highlights a planning consideration that would ultimately have a serious impact during execution. There were a limited number of airfields available in Greece, and they were geographically dispersed. German forces defeated Greek and British defense forces swiftly when they invaded Greece. The speed of this success, however, strained the German logistic system. In essence, German forces had outpaced their supporting elements, to include, in some cases, the engineer support necessary for the construction and repair of airfields. By 20 May, the principal airfields for supporting Operation *Merkur* were

Topolia and Tangara, near Athens, and Corinth respectively, and Argos, Milos, and Scarpanto.[40] Von Richthofen's VIII Air Corps operated principally out of the latter three. Student's XI Fliegerkorps planned to use the Athens aerodromes as the assembly area for the paratroopers. As stated earlier, the distance between these locations made mutual tactical support challenging because of the limitations on the range and endurance of the aircraft as well as the limited communications. The distance created logistical strain as well, particularly with the delivery of fuel.

Aircraft consume a great deal of fuel, particularly attack aircraft that are conducting strikes at lower altitudes, like the Stukas, and transport aircraft like the Junkers carrying a full load-out of troops and gear. The Germans already had a shortage of aviation fuel in Greece because their logistics had not kept up with their rapid advance. The projected sorties for *Merkur* added additional strain that they failed to adequately plan for. Due to a shortage of fuel, they had to delay the attack on Crete from its originally planned date of 17 May until 20 May as they struggled to distribute sufficient aviation fuel to the units involved.[41] They solved this problem by loading an Italian tanker ship, the *Rondine,* with 5,000 tons of aviation fuel and escorting it to Patras. Unfortunately, the Greek ports did not support in-line fuel transfer, so the fuel was transferred to drums and offloaded onto trucks which then distributed fuel to the various airfields.[42] Student's staff however, failed to account for the increased refueling time required to refuel the aircraft from drums vice the usual fuel trucks. They also failed to allocate additional refueling support personnel to manhandle the drums from the trucks to the aircraft.[43] This

[40] Forty, *Battle of Crete*, 54.
[41] Beevor, *Crete,* 80.
[42] Pissin, "The Battle of Crete," 72-74; Beevor, *Crete*, 83. An additional delay occurred at the Corinth Canal when the ship's captain insisted the hull be scoured by divers for mines. Most of the fuel did not arrive until several hours before the first wave's launch time.
[43] Prekatsounakis, *Crete: The Battle for Heraklion*, 29. This oversight became apparent the morning of 20 May. Paratroopers awaiting transport were hastily dragooned into ad-hoc refueling teams. Prekatsounakis references

seemingly minor detail regarding logistics and refueling operations will be re-visited during discussion of German execution on 20 May.[44]

There was another planning constraint that Student's staff failed to account for, the topography of the hastily constructed airfields. The spring climate in Greece is warm, sunny, and dry. The dirt runways generated large amounts of dust that restricted the visibility of the pilots on launch and required delayed departures until the dust cleared. Additional time for launching aircraft was not factored in to the calculus of the assault's timeline. This too would impact operations on the day of execution.

GERMAN AIRBORNE FORCES IN WORLD WAR II

During the interwar period the Germans had pioneered airborne operations in lieu of their ability to raise other forces. As a result, the majority of the paratroopers were young, adventure-seeking volunteers, many of whom grew up in the Hitler Youth organizations.[45] In 1941, these paratroopers were highly motivated and well trained and veterans of several successful operations in the Netherlands and Norway.[46] Their officers were talented and bold, trained in what today is called "Mission Command." German airborne forces therefore were unique, elite, light infantry that belonged to the Luftwaffe and not the Wehrmacht. They were organized into the XI Fliegerkorps, which consisted of two divisions: the 7th Airborne and the 22nd Luftland.

The 7th Airborne Division had three paratrooper regiments, a Sturmregiment that specialized in gliders, and additional small supporting battalions comprising combat engineers,

---

the diary of German paratrooper Bernd Bosshammer as saying, "We must refuel the JU-52s, using hand pumps and 200 litre fuel barrels."

[44] Pissin, "The Battle of Crete," 73. The 502 JU-52's required 208,030 gallons of fuel per wave. The drums carried 53 gallons meaning each wave of transport aircraft required 3,925 drums. This number does not factor in the fuel requirements of VIII *Fliegerkorps* bombers and fighters supporting the assault. Pissin estimated the fuel requirement exceeded a million gallons per day. Using an average weight of 6.8 pounds per gallon for aviation fuel, the *Rondine* delivery was 1,470,588 gallons, roughly enough fuel for a day and a quarter.

[45] Beevor, *Crete,* 77.

[46] Specifically, the *Sturmregiment* had seen the most action.

artillery, anti-tank, medical, and headquarters personnel. Total strength on paper was approximately 12,000 men. The 22nd Luftland Divison was an air assault unit trained and organized for rapid deployment via transport aircraft to expand an airhead created by the paratroopers. During Operation *Merkur*, the 22nd Luftland Division however was deployed in Romania at Ploesti to guard the oilfields. In its place, Student was given the 5th Gebirgs Division under Generalmajor Julius 'Papa' Ringel.[47] Consisting of two rifle regiments, 85th and 100th Gebirgsjager, of three battalions each, and an artillery regiment of two battalions, the 5th Gebirgs at full strength totaled 14,000 personnel of all ranks. They were reinforced with the 141st Gibergsjager regiment from the 6th Gerbigs Divison, a motorcycle battalion, and a tank company from 5th Panzer Division.[48]

The paratrooper regiments of the 7th Airborne Division were heavily armed with a variety of small arms, grenades, and submachine guns. However, they jumped from low altitude with only pistols and a few grenades, recovering their weapons and ammunition from special canisters dropped separately after landing.[49] The Sturmregiment was different in this respect because they used 7-8 man gliders to land in-zone. They were therefore already armed with their MP-38 sub-machine guns, and carried the 7.9mm MG-34 light machine gun and Kar 98k rifles with grenade

[47] Crete, 1941: Germany's lightening Airborne Assault. 21, 31.

[48] Forty, *Battle of Crete,* 89-90; Palazzo, *Battle of Crete,* 127. The 5th Gerbigs was an experienced and battle-hardened unit recruited predominantly from the Austrian Mountains. Like the paratroopers, they were also light-infantry, but they had a heavier compliment of mortars, machine guns, and anti-tank weapons. They were adept at using mortar fire to pin down their adversary in mountainous terrain while an outflanking force would use climbing gear to get behind defensive positions. The 5th Panzers provided a tank company equipped with PzKw Mark II's, which landed on Crete on 27 May after most of the fighting was already over.

[49] Palazzo, *Battle of Crete,* 42. German paratroopers were limited by their RZ16 chutes. The parachute's rigging caused the trooper to pitch forward on landing and required a landing roll. Protruding weapons were likely to cause injury.

launchers as well. Additional weapons that were dropped in by air included 81mm mortars, PaK 36 anti-tank guns, Flak 38 anti-aircraft guns, and the LG-40 75mm, a recoilless artillery piece.[50]

German paratrooper doctrine emphasized using the Sturmregiment and its gliders to capture key tactical positions, such as bridges and fortified positions or air defense clusters. Paratrooper doctrine called for a low-altitude jump from Junkers JU-52/3m transports, between 300-600 feet above ground level, directly on top of their objectives. The dispersed forces would then combine to form perimeters threatening the enemy in multiple places. This was known as the 'drops of oil' technique.[51] The risk associated with landing practically unarmed in the midst of an enemy defensive position was, in theory, mitigated by pre-landing fires primarily delivered by aircraft.[52]

THE BATTLE OF CRETE

Historians generally define the actual battle to have begun on 20 May, 1941 and see it as ending with the withdrawal of the last allied forces on 31 May, 1941. Accounts of the battle are numerous. Typically, they draw upon post-war allied accounts and focus on the Allied defense and why it failed. Most published works generally agree on the timelines and events of the battle but there are some important differences and the occasional error that are worth noting. As many as three different nomenclatures exist for the towns on Crete.[53] This causes some confusion as evidenced in Antill's work when he writes, "The German main effort was focused upon the

[50] Palazzo, *Battle of Crete*, 45; Antill, *Crete, 1941*, 69. The artillery came as a surprise to the allies, though it is doubtful that the seven guns deployed gave the Germans a decisive advantage at Crete. The 320 pound gun could be dropped via parachute in four pieces or delivered internally by a JU-52. The LG-40 had a range of 6800 meters.
[51] Lucas, *Storming Eagles,* 11.
[52] Richard M. Arbogast, "Operation *Market Garden*: The Failure to Utilize German Airborne Innovation," (Quantico: USMC CSC, 2016), 18-19. Major "Dickie" Arbogast provides a detailed look at German airborne tactics including their three preferred landing methods with relation to the objective area. These are: on-top for ground defenses, nearby for bridges and airfields, and at a distance in preparation for a deliberate ground attack. See also Hellmuth Reinhardt, *Airborne Operations a German Appraisal,* CMH Pub 104-13, (Washington DC: US Government Printing Office, 1989), 54.
[53] English, Greek, and Ionian nomenclatures can be found to depend on the authors background, the maps referenced, or personal proclivity. See also, Morris, *Kreta Als Beispiel.*

center of government located near Suda Bay" implying that the airfields were never the main effort.[54] Additionally, there are numerous examples of units, on both sides, being called by a variety of names. This is particularly prevalent with regards to Commonwealth forces.

There are several factual points too that must be addressed. First is a discussion of troop strength and capability. There are several different allied troop strengths listed. This work accepts the number of 42,500 allied troops and 22,750 German troops as being the most accurate counts of the forces involved.[55] Allied casualties were close to 18,000 with 6,116 German casualties.[56] Allied force breakdown in Antill's work lists nine Type I Matilda tanks of the 7th Royal Tanks as being the main armor force available to the allies on the island and states that, "they were in poor condition and antiquated." This seems debatable at best. Photographic evidence clearly shows the hulks of Matilda Type II tanks on the island.[57] It also shows them in vicinity of the beaches from which allied forces eventually withdrew implying that the tanks were operational right up until their crews departed. Antill also states that, regardless of the Matildas, the allies lacked light-armored mechanized assets, specifically the capable British Bren carrier.[58] This is a blatant error. There were 16 Mk VI-b tanks on island with the Kings Hussars as well as a number of Bren carriers.[59] Finally, the scarcity of trucks for transporting troops and supplies is frequently referenced in a number of works as an allied shortcoming that prevented the assembly of a proper reserve force. Yet a close look at the evidence suggests that there were sufficient trucks in allied control to move multiple battalions at any given time.[60] This calls into

[54] Antill got the names mixed up and confused the main effort's target as being Suda Bay vs Maleme airfield.
[55] Stewart, *The Struggle for Crete,* 53, 79; Pissin, "The Battle of Crete," 215.
[56] Stewart, *The Struggle for Crete,* 474-476. Allied casualties include 11,835 prisoners.
[57] Prekatsounakis, *Crete: The Battle for Heraklion,* 217.
[58] Antill, *Crete 1941,* 24-25.
[59] Palazzo, *Battle of Crete,* 66. Additionally there was an entire field mechanic company deployed in Suda Bay that kept the Allied vehicles operating.
[60] Forty, *Battle of Crete,* 80.

question the oft-proffered excuse for allied forces being under-resourced.[61] It also begs the questions of why the defense was unable to mount a successful counterattack against Maleme airfield and how did German light-infantry defeat a superior force with a mechanized advantage? With these thoughts in mind, let us turn to a brief description of the battle itself, focusing on the "why" of decision making and what the German commanders knew and when.

On the morning of 20 May, 1941, the German Luftwaffe commenced Operation *Merkur*. Dive bombers from Richthofen's VIII Air Corps launched from Milos, Argos, and Scarpanto and began the forty-five minute flight to Crete to strike pre-planned targets. At approximately 0700, and as planned, the initial assault wave launched from Topolia airfield and assembled overhead where they were joined by their escorting fighters. With the benefit of hindsight we can identify several tactical challenges that immediately influenced the future course of the battle. However, it must be remembered that these were not readily apparent at the time of execution to German leadership. As mentioned earlier the dust at the airfields caused delays in launching and assembling the first wave. While this was apparent to the flight officers on the ground at the airfields it could not be communicated to adjacent forces or higher command due to communications being cut. A second challenge arose in the suppression and disruption of allied anti-aircraft batteries. Most accounts assert, "allied anti-aircraft batteries were ineffective against the German airborne assault either because they were too few in number or had been suppressed by airstrikes."[62] German intelligence on the location of allied batteries was minimal. Allied orders to their batteries were to hold their fire during the preliminary attacks so as not to give away their positions and to conserve ammunition for use against the airborne assault. When the first wave did appear overhead the drop zones, they immediately started taking anti-aircraft

[61] Stewart, *The Struggle for Crete,* 95-102.
[62] Beevor, *Crete,* 107.

fire. While the number of aircraft that they downed is considered relatively minor (7 out of 493 is barely 1%) the effect was considerable in that it broke up the landing plan, in some cases causing the paratroopers to jump into the wrong landing zones. The cumulative effect was a lack of surprise and a loss of massed forces and the speed necessary to seize the German objectives.

This was not readily apparent to Student. Following the return of the first wave all he knew was that seven aircraft had not returned. On the face of it, this seemed to indicate that the assault was going as planned. He was unaware that they were in the wrong zones, dispersed, and increasingly taking heavy casualties. He was also unaware that most of the air defense positions were still active as well as the allied artillery positions that ranged Maleme airfield. Confident that the first wave was accomplishing its mission, based on the knowledge that only seven transport aircraft had been shot down, Student stood down his reserve force and prepared to launch the second wave. Meanwhile, the CreForce Commander, General Freyberg, assessing that the airborne force lacked sufficient strength to be the main effort, continued to look seaward for an amphibious assault.[63]

The second wave of the German assault met with additional challenges. Their departure was delayed, not only by the dust, which still had not been mitigated, but also by re-fueling operations, which had not been well thought out, as previously discussed. When the second wave departed, a full three hours behind timeline, they ominously passed their escorts and close air support aircraft returning from Crete.[64] The anti-aircraft fire they faced around Heraklion was of increased intensity compared to Maleme earlier in the day, and again, while the numbers do not indicate that they suffered excessive losses, the overall effect was to disperse the airborne

[63] Stewart, *The Struggle for Crete,* 48-49; Palazzo, *Battle of Crete,* 18. Lieutenant-General Sir Bernard C. Freyberg commanded the New Zealand Division in Greece and was a close friend of Winston Churchill. His customary staff from the New Zealand Division was not with him on Crete and he had to make do with an ad-hoc headquarters.
[64] Prekatsounakis, *Crete: The Battle for Heraklion,* 31.

forces and degrade their advantages of surprise and mass.[65] It was the returning JU-52's however that finally relayed a situation update to Student that provided a much more alarming picture of the battle than the one he entertained earlier in the day.

As night fell and brought a close to air operations on 20 May, Student gradually realized that his paratroopers had failed to capture even a single airfield. Worse, their senior leadership was dead, their communication gear was destroyed, and most of the units had suffered heavy casualties and were in retreat or establishing defensive positions. The only semi-positive news was that one company of the Sturmregiment had established a foothold near Maleme airfield and was engaging the defenders of Hill 107, key terrain for controlling that particular airfield.

Student was not alone in a shortage of information. Von Richthofen's attack squadrons were also ill informed. With little to no communication with the paratroopers on the ground their close air support was limited to striking targets that their own reconnaissance aircraft could pick out. With many of the ground positions concealed in terrain or buildings the air attacks focused in the vicinity of Suda Bay. In line with operations that he had started a week prior to the assault on Crete, Richthofen was also actively searching for the Royal Navy. He was unable to make contact with them however because they were out of range to the south of Crete preparing to move into position under cover of darkness in order to intercept the German amphibious support effort.[66]

The battle for sea control around Crete was unlike anything that occurred up to that point in World War II. As mentioned, the *Luftwaffe* had already started contesting sea control several

[65] Pissin, "The Battle of Crete, 214. They did however take much higher losses of aircraft then the first wave. XI *Fliegerkorps* records list 443 JU-52s as "mission capable" on 21 May, 50 less than the 493 launched on 20 May. The Germans lost 143 JU-52s in the battle: 7 were lost on the first wave, suggesting 43 were shot down or otherwise lost or damaged during the second wave on 20 May with a corresponding loss of aprox. 500 paratroopers. Pippin, 214.

[66] Thomas, *Nazi Victory*, 119, 129. The Royal Navy was well informed of the approximate point of departure of the German amphibious force and their likely arrival time due to ULTRA, and they used reconnaissance aircraft during the battle to confirm this information.

weeks prior to 20 May. Admiral of the Fleet Andrew Browne Cunningham now responded with a naval bombardment of the German airfield at Scarpanto.[67] He held his main battle fleet off to the West of Crete in position to strike the remainder of the Italian battle fleet should it put to sea. Under cover of darkness the night of 20 May/morning of 21 May, a naval task force moved into position to the North of Suda Bay and intercepted the first of two German amphibious forces. Richthofen's aircraft were unable to prevent the destruction of this amphibious force. Nor were they able to defend the second amphibious effort on the 22nd, but the German planes exacted a heavy price and all but drove the Royal Navy from the waters North of Crete. Following this costly forty-eight hours, Admiral Cunningham reported that further naval operations around Crete could only be risked during the hours of darkness, effectively admitting a loss of sea control in the area.[68]

Student aggressively sought to regain the initiative on the morning of 21 May. Receiving a report that a portion of Maleme airfield had been captured, he dispatched a trusted aide aboard a JU-52 to land, under fire, at the western edge of the airfield and report back with the situation. Meanwhile, he readied his reserve force and staged the 5th Gebergs. Upon the aide reporting back that the airfield was available for landing and that Hill 107 had been captured, Student launched his reserve force to reinforce the foothold at Maleme. Additional JU-52s with supplies and ammunition were dispatched to land on the western end of Maleme. The airfield came under increasing German control as the afternoon wore on. With most of the forward observers eliminated, the artillery threat to landing aircraft was alleviated, and around 1700 the first elements of the 5th Gebergs started flying in on JU-52s, eventually massing both regiments by

[67] Known by his initials, "ABC" Admiral Cunningham commanded the British Mediterranean Fleet until his promotion to First Sea Lord in 1943. He led the Royal Navy to victory at Taranto in 1940 using naval aircraft from carriers and also defeated the Italian fleet at Matapan in 1941.
[68] Thomas, *Nazi Victory,* 174, 178,

the afternoon of the 22nd.[69] An allied counter-attack on the night of the 21st briefly threatened to re-take Maleme but proved unsuccessful due to poor coordination and the lack of a mobile reserve. The battle would continue on until the last allied forces were evacuated on 1 June, but the airborne portion was essentially over.[70] Supplies continued to be airlifted in until 25 May, when German forces opened the port at Kastelli. Having won sea control on the north side of Crete two days prior, they were now able to use the small port to sustain and reinforce further action on Crete.

OBSERVATIONS FOR FORCIBLE ENTRY OPERATIONS

U.S. Army doctrine considers airborne forces to be a "strategic asset," a rapid response "break glass in case of emergency" force. Conversely, Marine Corps doctrine views the air assault as a component of amphibious warfare; a key connector from ship to shore.[71] Today, however, neither service is capable of conducting a forcible entry option alone. The ability to conduct a forcible entry is a means of power projection that is frequently limited by the necessity for conducting operations on exterior lines. A vertical envelopment, whether by airborne assault as studied here at Crete or by air assault in the modern age using helicopters and tilt-rotor aircraft, attempts to reduce the challenge presented by exterior lines. However, it has a critical requirement of multi-domain superiority. Crete demonstrates this. The allies practically ceded the necessary air superiority to the Germans right from the start. However, they contested sea control sufficiently to disrupt the amphibious portion of the operation. The German offense struggled to advance until local German sea control was assured and seaborne logistics started arriving. Today, air superiority, sea control, and electromagnetic spectrum superiority enable

[69] Forty, *Battle of Crete,* 93-95. Six hundred and fifty light infantry of the 100th Gebergsjager Regiment were brought into Maleme before dark on the evening of the 21st.
[70] Antill, *Crete, 1941,* 62. The last airborne effort was a jump of four hundred reinforcements at Heraklion on the 25th.
[71] Crete suggests that a vertical envelopment should be employed for strategic objectives. The Marine Corps has a very limited ability to conduct a vertical envelopment for operational objectives.

the logistical support and C2 platforms necessary to sustain a vertical envelopment operation. Due to the high risks associated with a vertical envelopment today's force should look to focus on opening and exploiting a temporary superiority 'window' to attack a strategic target.[72] A study of Crete suggests the following recommendations.

First, German success on Crete stemmed in part from the Joint nature of *Mercur*. This is a key takeaway. To successfully employ a vertical envelopment to accomplish a strategic task will require a Joint force. The modern A2AD environment is such that multi-domain superiority cannot be guaranteed. It will take a Joint force to contest this and to create a 'window' of time and space through which a vertical envelopment can strike and be supported. As the Marine Corps shifts to focus on the Fleet Marine Force, it should consider contributing to the Joint force by providing an air assault element of V-22 Osprey aircraft carrying a reinforced infantry company.[73] This leverages the range and speed of the V-22 to deliver tactical firepower directly onto the objective much like the German Sturmregiment.

Secondly, the importance of close air support cannot be overlooked. Without close air support, an airborne force is in extreme peril, not only the delivery vehicles, but the troops as well, once they have landed. At Crete, the shortfall in air support occurred because of failures in planning, communication, and timing. These lessons will always be relevant. However, to mitigate them it is recommended that an unmanned close air support capability be explored that can accompany the V-22 into the objective area and remain on-station in a direct support role. These unmanned air support assets should be controlled by embedded Forward Air Controllers and Joint Terminal Attack Controllers.

---

[72] The future force, however, needs to be designed to operate outside the constraints of multi-domain superiority. This will require advances in technology. Specifically, a near-hyper-sonic delivery vehicle, drop-troops with exoskeleton armor that enables them to move rapidly on landing while carrying heavy-weapons, air-dropped vehicles, and 3D printers.

[73] They need to be resourced with heavy weapons and some limited vehicle assets. The tactical intent is to land directly on the objective and overwhelm the adversary with the combination of speed, shock, and firepower.

Last but not least, Crete impresses upon us the importance of logistics and its challenges in supporting a vertical envelopment. There is never enough 'lift,' whether by air or by sea. General Student lacked sufficient aircraft to complete the attack in one airborne wave. This increased the complexity of the timeline and the launch and recovery of aircraft. He also lacked adequate shipping to truly have an amphibious capability. At present, the Joint force lacks sufficient lift to risk supporting a vertical envelopment.[74] A possible solution to this may be the use of directed energy weapons for missile defense aboard America Class Landing Helicopter Assault ships (LHA's) carrying heavy-lift helicopters. If the A2AD missile risk can be sufficiently reduced for the ship to operate within 100nm of shore long enough to launch and recover a single wave of heavy-lift aircraft, it may be able to provide the necessary support to sustain the landing until multi-domain superiority is assured.

CONCLUSION

This research has several important theoretical and practical implications. First, the lessons learned from a study of Operation *Mercur* contribute to an understanding of the genesis and development of the offensive conduct of airborne operations in particular and of forcible entry operations in general. Secondly, this study contributes to the growing body of work focused on planning and executing such operations. Third, as always, it is important to study military history, since past and present engagements and conflicts frequently portray underlying similarities. Thus, lessons learned from German airborne assault planning and leadership decisions in the invasion of Crete can be used to inform future operations and military decision making and, thus, to avoid costly mistakes.

[74] The proliferation of air defense systems around the globe beginning in 1970 has increased the risk to force of any airborne forcible entry option. In their current form, vertical envelopment operations no longer provide a forcible entry option against a peer or near-peer adversary. The Joint force is unable to re-constitute the likely number of aircraft it would lose trying to support such an operation. The German airlift fleet never recovered from its losses at Crete.

This paper has focused on how understanding the risks of vertical envelopments informs decision making with relation to strategic goals. Operationally, it has touched on the importance of domain superiority, specifically air superiority and sea control, in enabling logistical support and reinforcement of an airhead. The tactical challenges of C2 throughout a vertical envelopment were also identified. Notably, all of the above considerations have only increased in today's security environment, particularly with regards to a peer or near-peer adversary. Perhaps the most enduring lesson though is the importance of domain superiority.

Von Richthofen's VIII Air Corps seized and maintained air superiority with minimal opposition from the Royal Air Force. They moved rapidly to expand their operational range by constructing advance expeditionary airfields that enabled them to challenge the Royal Navy for local sea control. Ultimately, though unable to prevent the interception and destruction of the German amphibious force, the *Luftwaffe* was successful in driving the Royal Navy away and in maintaining local sea control by air power alone, during daylight, for the remainder of the battle. This, in and of itself, was an important first during the war. The additional, perhaps more important takeaway, however, is the British Navy's response. Admiral Cunningham continued to risk his ships and crews until they had evacuated the vast majority of the allied forces on Crete.[75] His resolve and actions warrant additional study by naval leadership preparing for operations in a contested maritime environment.[76]

Crete provides an excellent example of the importance of supporting lines of effort. Airborne forces are not capable of unsupported sustained operations. They require additional

[75] Thomas, *Nazi Victory,* 16. As noted earlier, the Royal Navy lost three cruisers, eight destroyers, over 2,500 personnel killed or wounded, and fifteen additional capital ships severely damaged.

[76] Cunningham's leadership is not the only take-away. He sought to minimize the risk to his ships and crews by operating from dusk to dawn, sacrificing ship size and firepower for speed, and bolting ground unit's anti-aircraft guns to the main decks. He also used the ULTRA intelligence he received to identify the airfield in Scarpanto, where the German dive bombers were stationed, and hammered it with naval gunfire from a cruiser force coupled with an attack by naval aircraft from his lone aircraft carrier.

reinforcements, particularly mechanized and fire support assets, if they are conducting anything other than a raid. For forcible entry operations, this means an amphibious component will most likely be required. The concept of timing should be carefully considered by modern day planners as well. The strength of an airborne assault is the ability to mass force rapidly across time and space in an unexpected location. This creates initial shock, initiative, and offensive tempo. Here again, additional forces, delivered via an alternate method, are required in order to exploit the temporary advantage created by the airborne assault. In the case of Crete, the German paratroopers never achieved the shock they hoped for because they did not mass sufficient force to seize their objectives. Luck favored them however, and the allied defenders provided the Germans a second opportunity to conduct an additional airborne assault. Thus, Student's reserve force re-captured the initiative, secured the airfield at Maleme, and enabled sufficient follow-on forces to flow in via the airhead to create offensive tempo.

This highlights a second learning point, the need for a rapidly deployable reserve force. This does not refer to a strategic reserve force, such as that provided by the 82nd Airborne. Rather it refers to an on-call force with sufficient firepower to weight success or stabilize a reverse. Marine Corp Amphibious Doctrine frequently designates a "Sparrow Hawk" or "Bald Eagle" force to provide this function during amphibious operations. The scale is determined by the engagement. At Crete, Student had wisely retained a small reserve force of paratroopers that he could commit rapidly. Recall though, that after the first wave landed, apparently successful, he stood down this reserve force. The records do not indicate conclusively why he made this decision, but it likely had to do with the limited number of available JU-52 transports and the need to use them for the second wave. A viable reserve force in an airborne scenario *must* be resourced with dedicated aircraft and personnel that are not included in the calculus for the rest of the assault. It also must be appropriately supplied with fuel.

As noted, the German fuel troubles are frequently mentioned throughout histories of the battle. However, most historians merely make note of how this delayed the attack by several days and then move on. As previously mentioned, the issues with fueling the first wave and then refueling the second wave on 20 May significantly impacted the timing. A majority of Richthofen's strike packages, while on time per the original assault timeline, arrived well before the airborne troops. The enemy defenses therefore were not suppressed as planned. For the first wave, this problem was initially mitigated by the Sturmregiment's success in over-running the allied air defense batteries around Maleme. However, sufficient guns remained to disrupt the airborne delivery of the paratroopers and deny them mass and surprise. For the second wave, the situation was much worse. With allied forces now on high alert from the first wave's attack, and no suppression from air strikes, the second wave was quite literally shot to pieces.

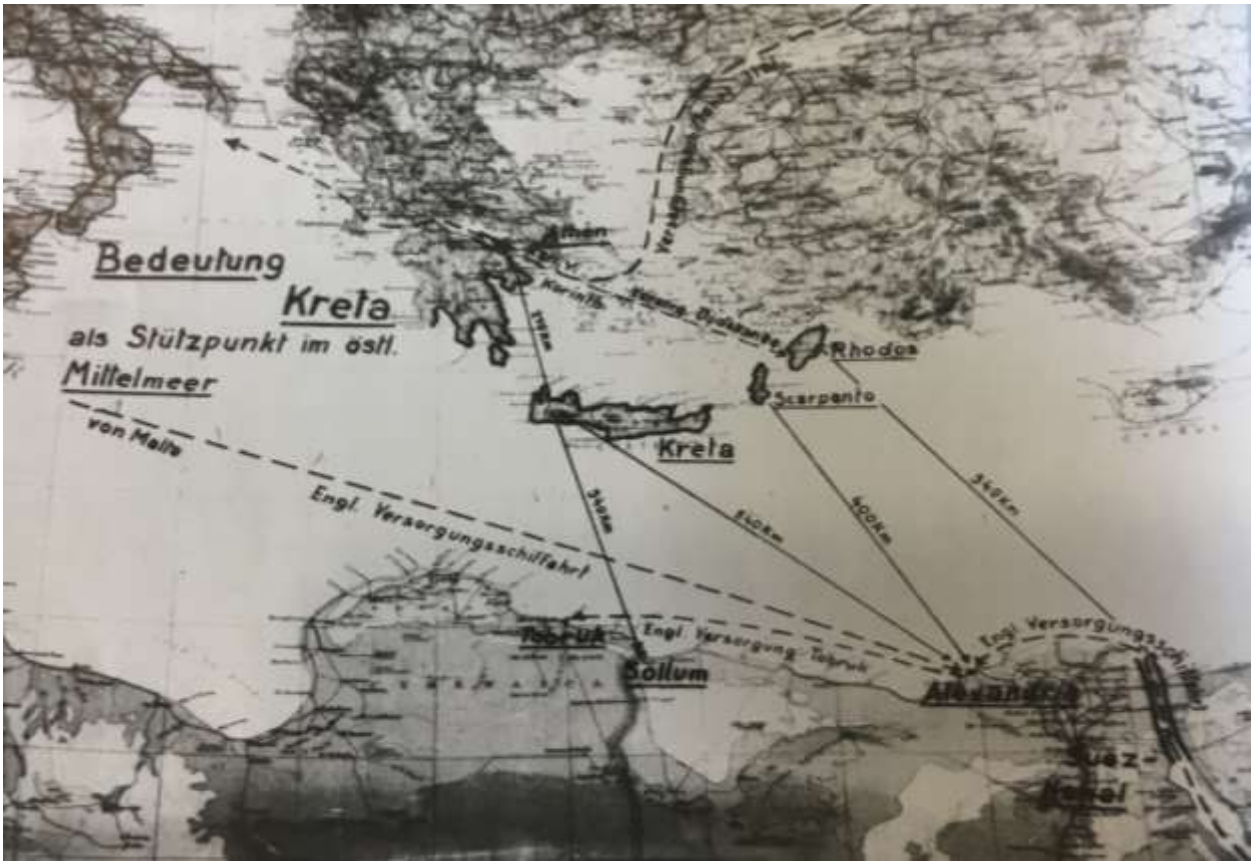
As future military planners and commanders wrestle with A2AD problem sets, they would be well-advised to study the Battle of Crete. The strategic advantages derived from properly trained and resourced airborne forces, employed appropriately, can be considerable. German airborne forces rapidly defeated a more powerful adversary and captured strategic terrain on Crete. However, using airborne forces as a forcible entry option against a peer adversary engenders significant risk, which is magnified if the airborne operations are not sufficiently supported. The XI Fliegerkorps took heavy casualties, both in specially trained men and specialized equipment. These valuable assets were not easily (or ever) re-constituted.

At day's end, for a vertical envelopment to be successful, a force of troops must be physically landed and sustained on the ground where they can employ overwhelming firepower with their weapons systems to defeat the adversary. Airborne operations are and will remain a high-risk operation, and due to the number of waves required to land sufficient force, the risk to force is even higher if helicopters and tilt-rotor aircraft are used to deliver an air assault. In the

highly contested environment of the modern age, it is imperative that commanders recognize the current multi-domain superiority necessary to enable the link between amphibious support and airborne operations. It is no longer sufficient to have localized air superiority. At a minimum, sea control, electromagnetic spectrum superiority, and space superiority are also necessary. The trite argument that the nature of war remains the same but the character of it has changed does not weaken this inter-relationship. As we look to future force design and attempt to leverage advances in technology, it is recommended that we consider the applicability of a hyper-sonic delivery platform for vertical envelopments. If coupled with an airborne infantry force equipped with exoskeletons and heavy weapons, it may be capable of operating outside the requirements of multi-domain superiority. Speed of delivery coupled with the shock of firepower delivered directly to the objective in overwhelming force will get inside the adversaries decision-making loop, create time for follow-on supporting forces, and break the adversary's will.

APPENDIX A

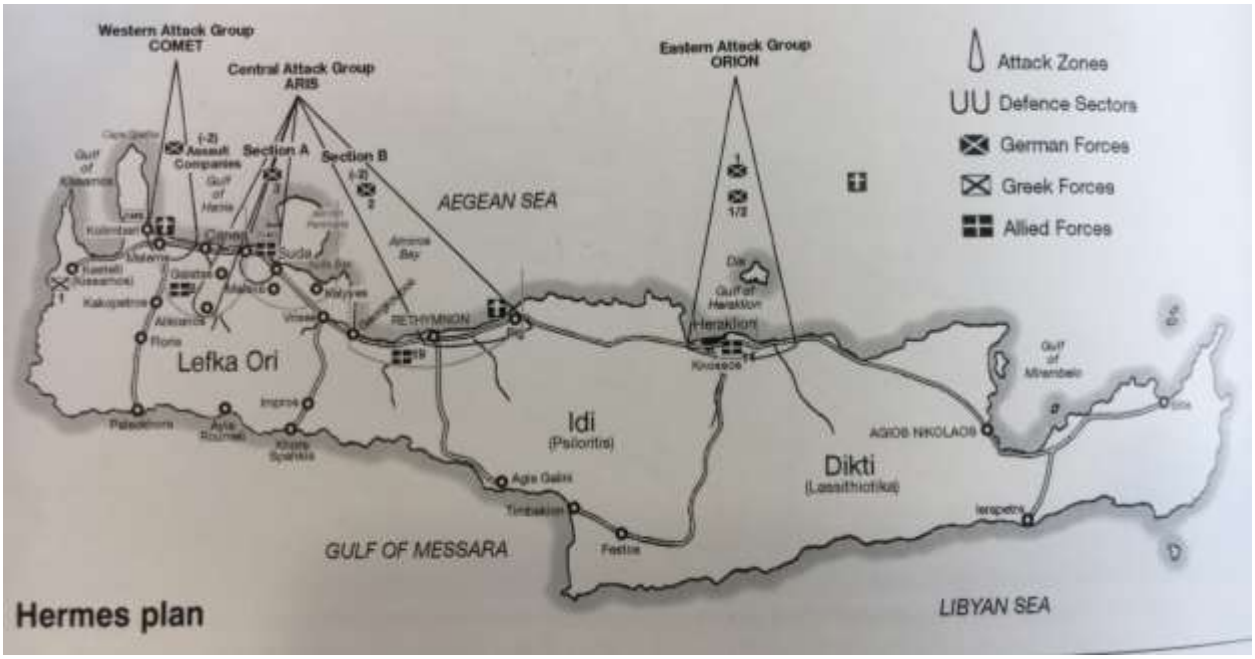
EASTERN MEDITERRANEAN THEATRE, 1941



Source: George Forty, *Battle of Crete*, (Hersham, Surrey 2001), 12. Note the operational distances for aircraft and ships between British bases and German and Italian airfields. The greatest distance traveled by German aircraft (one-way) from Greece was 210 km to arrive at Crete.

APPENDIX B

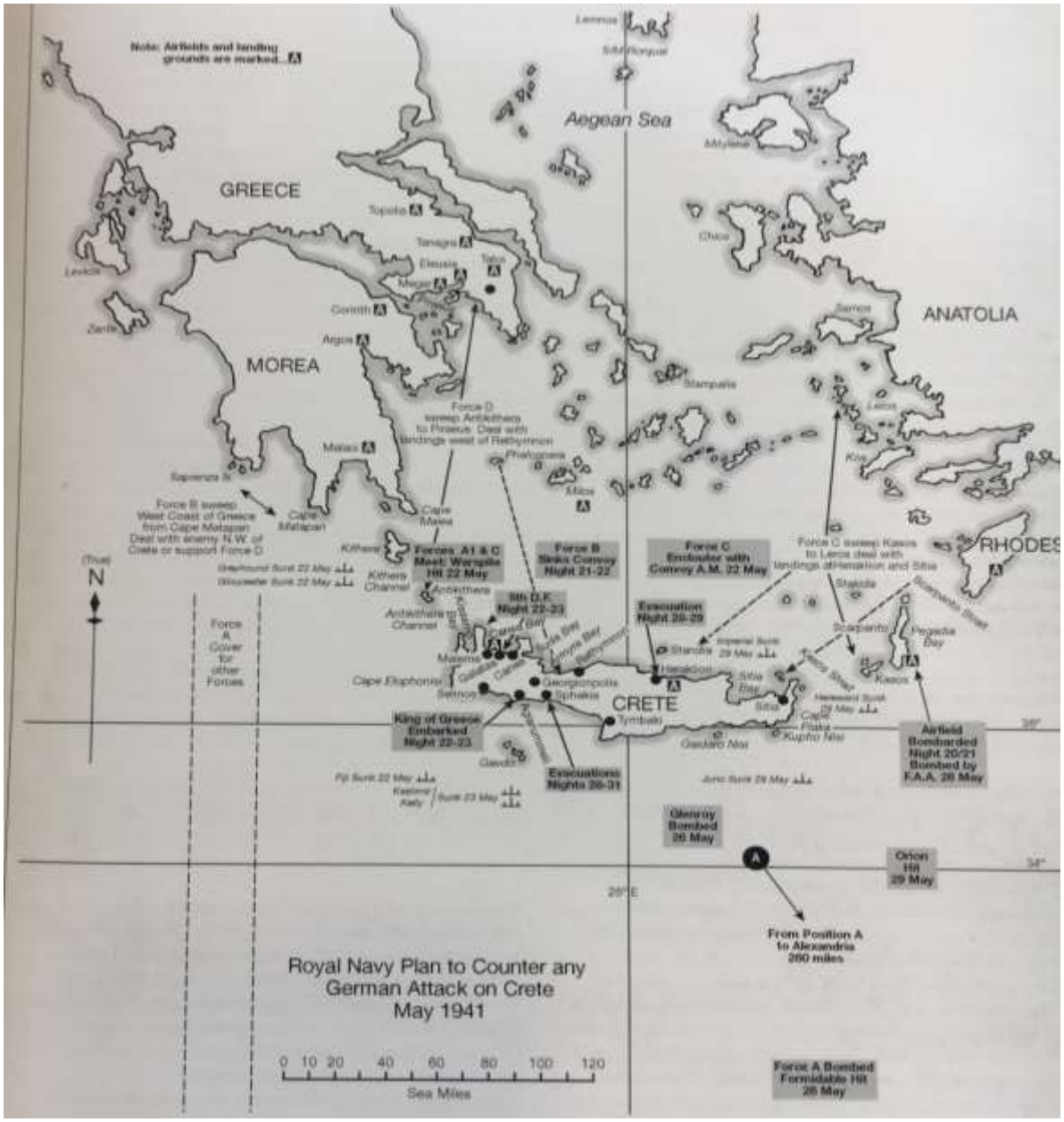
OPERATION *MERKUR* AIRBORNE PLAN, 20 May 1941



Source: George Forty, *Battle of Crete*, (Hersham, Surrey 2001), 74. This depicts the three separate German airborne assault groups. It also demonstrates the East/West linear nature of the island's single main road and the limitations it imposed on both sides. The terrain south of the road was extremely rugged with hills, valleys, and peaks running the length of the island.

APPENDIX C

THE FIGHT FOR SEA CONTROL AROUND CRETE, MAY 1941



Source: George Forty, *Battle of Crete*, (Hersham, Surrey 2001), 63.

APPENDIX D

MALEME AIRFIELD, 21 MAY 1941

Source: George Forty, *Battle of Crete*, (Hersham, Surrey 2001), 95. This picture was taken on the late afternoon of 21 May, 1941 as lead elements of the 5th Gerbigs Division landed at Maleme. Note the impacts of Allied artillery fire and the damaged Junkers aircraft that have been pushed to the side of the dirt strip.

BIBLIOGRAPHY

Antill, Peter D. *Crete 1941: Germany's Lightning Airborne Assault.* Oxford: Osprey, 2005.

Arbogast, Richard M. *Operation Market Garden: The Failure to Utilize German Airborne Innovation.* Quantico, VA: USMC CSC, 2016.

Beevor, Anthony. *Crete: The Battle and The Resistance.* London: John Murray, 2015.

Biank, Maria. *The Battle of Crete: Hitler's Airborne Gamble.* Fort Leavenworth: Army Staff College, 2003.

Brereton, Lewis H. Lt. Gen USA. *The Brereton Diaries: The War in the Air in the Pacific, Middle East, and Europe.* New York: William Morrow and Company, 1946.

Citino, Robert M. "Dead on Arrival." *The Quarterly Journal of Military History vol.18 , no. 2* (2010).

Corum, James S. *Wolfram von Richthofen: Master of the German Air War.* Lawrence, KS: University Press, 2008.

Davin, D. M. *Crete: The Official History of New Zealand in the Second World War*. London: Department of Printed Books, Imperial War Museum, 1953.

De Belot, Raymond Rear Admrl (French Navy). *The Struggle for The Mediterranean 1939-1945.* Princeton: Princeton University Press, 1951.

Forty, George. *Battle of Crete.* Hersham, Surrey: Ian Allen Publishing, 2001.

Gilbert, Martin. *Winston S. Churchill Vol. VI, Finest Hour, 1939-1941*. Boston: Houghton Mifflin Co. 1983.

Headquarters Department of the Army. *Airborne and Air Assault Operations.* FM 3-99. Washington, DC: Department of the Army, March 6, 2015.

Hooten, E.R. *Eagle in Flames: The Fall of the German Luftwaffe.* London: Arms and Armour Press, 1997.

Kavanaugh, Stephen. *Hitler's Malta Option: A Comparison of the Invasion of Crete (Operation Merkur) and the Proposed Invasion of Malta (Operation Hercules).* Fort Leavenworth: Army Staff College, 2006.

Kippenberger, Sir Howard, Maj. Gen. *Infantry Brigadier.* Oxford: Oxford University Press, 1949.

Lucas, James. *Storming Eagles: German Airborne Forces in World War II.* London: Arms and Armour Press, 1988.

McGibbon, Ian, ed. *The Oxford Companion to New Zealand Military History.* Oxford: Oxford University Press, 2000.

MacDonald, Callum. *The Lost Battle: Crete 1941*. London: Macmillan London, 1993.

Morris, Allen C. *Kreta Als Beispiel: German Airlift During the Battle of Crete*. Fort Leavenworth, KS: Army Staff College, 2014.

Morzik, D. Fritz. *Numbered USAF Study 167*, "German Air Force Airlift Operations." Maxwell AFB, AL: Air Force Historical Research Agency, 1961.

Palazzo, Albert. *Battle of Crete: Revised and Expanded 2nd Edit.* Canbarra: Australian Army History Unit, 2007. http://www.afhra.af.mil/studies/numberedusafhistoricalstudies151-200.asp (accessed 18 February 2020).

Pissin, D. W. *Numbered Air Force Study 162*, "The Battle of Crete." Maxwell AFB AL: Air Force Historical Research Agency, 1956. http://www.afhra.af.mil/studies/numberedusafhistoricalstudies151-200.asp (accessed 18 February 2020).

Prekatsounakis, Yannis. *The Battle for Heraklion: Crete 1941*. Tarxien: Gutenburg Press Ltd. 2016.

Quarrie, Bruce. *German Airborne Divisions: Mediterranean Theatre, 1942-1945.* Oxford: Oxford University Press, 2005.

Reinhardt, Hellmuth. *Airborne Operations a German Appraisal.* CMH Pub 104-13. Washington DC: US Government Printing Office, 1989.

Stewart, I.McD.G. *The Struggle for Crete, 20 May – 1 June 1941: A Story of Lost Opportunity.* Oxford, London: Oxford University Press, 1966.

Sweeting, C.G. "Silent and Deadly." *The Quarterly Journal of Military History vol. 25, no. 1*; 42-49,(2012).

Thomas, David A. *Nazi Victory: Crete 1941.*New York, NY: Stein and Day Pub. 1972.

Toprani, Anand. "The First War for Oil: The Caucasus, German Strategy, and the Turning Point of the War on the Eastern Front, 1942." *The Journal of Military History, vol. 80, no. 3.* 815-854, (July, 2016).

US Department of Defense. *Joint Forcible Entry Operations.* Joint Publication 3-18, May 11, 2017, I-1.