

GLIDERS OF WORLD WAR II:
“THE BASTARDS NO ONE WANTED”

BY
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DISCLAIMER

The conclusions and opinions expressed in this document are those of the author. They do not reflect the official position of the US Government, Department of Defense, the United States Air Force, or Air University.

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ABSTRACT

This study examines the role of combat gliders in Germany, the United Kingdom, and the United States during World War II (WWII). This thesis compares and contrasts each country with respect to pre-WWII glider experience, glider and airborne doctrine, glider pilot training, and glider production while outlining each country's major glider operations. The author then compares the glider operations in the China-Burma-India Theater to the operations in Europe to describe the unique challenges based on the terrain and mission. Next, this thesis presents an analysis of the glider's precipitous decline following WWII. The study concludes with recommendations for glider operations in the future based on the experiences of the past.

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Chapter 1

Introduction

I'll tell you straight out: If you've got to go into combat, don't go by glider. Walk, crawl, parachute, swim, float—anything. But don't go by glider. ...Riding in one of those Waco gliders was like attending a rock concert while locked in the bass drum. ...The field was scattered with gliders on their noses, on their sides, on their backs. It was a scene from hell, but the 101st seemed pleased that it was a successful glider operation.

Walter Cronkite

Background

The story of the glider has few antecedents and even fewer remainders. Its complete combat application and employment is contained in a mere five-year history of World War II. Unlike many weapons used in World War II, the military glider had no wartime predecessor. The slow, crawling British tanks that surprised the Germans at Cambrai in World War I were the forerunners of the fast-moving, powerful Sherman, Churchill, Tiger, and Stalin tanks of World War II. Artillery, with its devastating effects in the first war, required few modifications for improvement in the second war. Airpower, with its sophisticated fighters and bombers of World War II, evolved directly from the dog-fighting Spads, Fokkers, and de Havillands of World War I.¹ The story of the glider is different.

The glider had never flown in combat before World War II. The first gliders used in combat were simply a by-product of the fragile, sports sailplane used in the decades preceding the second war. As many countries dreamed of the possibilities of transforming the sailplane into a weapon of war, it was Germany and the Soviet Union who took the first actions to make it an actuality. The possibility became reality on 10 May

¹ James E. Mrazek, *The Glider War* (New York, NY: St. Martin's Press, 1975), 18.

1940, when the world awakened to the startling news that a small German force used simple gliders as weapons to quickly seize the key Belgian Fort Eben Emael. The combat application of the glider was born.

The German success at Eben Emael proved that the glider had the ability to deliver men and machinery with devastating tactical surprise. Military leaders on both sides of the Atlantic began to take notice in the potential of the glider. Gliders might now influence both the tactical and operational conduct of war—creating another tool to meet the desired objectives. The mobility of gliders demonstrated that rivers were no longer formidable barriers to armies. Troops were no longer susceptible to the dangers of crossing on footbridges or defenseless assault boats as gliders could form an air bridge over the rivers. Gliders, loaded with supplies, simplified logistical problems of supplying ground operations by accurately delivering their loads directly to the front. Visionaries even speculated that gliders could transport tanks to combat, a job that no airplane then in existence could do.

Despite the tremendous potential for the military glider, neither the United States (US) nor the United Kingdom (UK) was prepared to use them at the dawn of World War II. Neither country had combat gliders; there were no qualified combat glider pilots, no glider infantry regiments, and no trucks, tanks, or artillery pieces suitable for transport in gliders. Moreover, neither had doctrine for employment of gliders, and few people had any idea on how, when, and where to use gliders. A study of the glider's rise and eventual fall from military favor in Germany, the UK, and the US provides significant insight into the demise of weapon systems--even systems whose abilities cannot be duplicated and still have military relevance.

Significance of Topic

The military glider played a unique role in combat aviation. The glider is one of the few aviation weapons whose lifetime spanned only one war and its unique characteristics made it exceptionally useful in a

variety of roles. Germany, the UK, and the US each took different roads in glider procurement, training, and employment. Each nation met varying degrees of success with glider employment based on their specific needs and requirements. Despite the success of their gliders, all three nations decided to abandon them soon after World War II. What considerations caused the elimination of a very useful capability even when no similar capability existed? Does the dynamic environment of the Global War on Terror (GWOT) and rise of irregular warfare warrant a reconsideration of gliders for the modern military? This thesis will provide policy makers, decision makers, and military strategists important insights into the factors that led to the termination of a key military capability with no true replacement.

Research Question and Methodology

This research seeks to answer the question: Given their unique attributes and proven performance, why did the United States military abandon gliders after World War II? During the initial phase, the research question expanded to encompass an additional question—the differences in the procurement, training, doctrine, and employment of gliders in Germany, the UK, and the US. These unique case studies will highlight their distinctions in tactical employment, which generated corresponding procurement, training, and doctrine decisions. Each country took a different path in their combat application of gliders.

The thesis makes extensive use of primary source data including personal papers, training regulations, official memorandums and unit histories to illustrate the US perspective on gliders. The Air Force Historical Research Agency serves as the central repository for the primary source data. Its collection is extensive, particularly so in this case, and unquestionably authentic. This paper draws upon secondary sources for the German and British perspectives. Secondary sources also provided significant contextual material regarding the relative

success and failures of glider operations in World War II as well the various opinions of gliders from military and civilian leadership.

Overview and Organization

The next chapter, *German Gliders*, chronicles German glider development, training, and employment prior to and in World War II. Germany was one of the earliest advocates of the glider in part because of the crippling impact of the Versailles Treaty on traditional military aircraft. The chapter examines early German glider doctrine, which drove glider pilot training and procurement. The chapter describes the key employment of German gliders at Fort Eben Emael, the seizure of Crete, and the unconventional use of gliders in the rescue of Benito Mussolini. Finally, the chapter examines the events and personalities that contributed to the German shift away from glider employment. The sources for this chapter rely heavily on secondary sources including James Mrazek's *The Glider War*, James Lucas' *Storming Eagles: German Airborne Forces in World War Two*, Roger Edwards' *German Airborne Troops 1936-1945*, and Callum MacDonald's *The Lost Battle of Crete 1941*.

Chapter 3, *British Gliders*, examines the UK glider development, training, and employment in World War II. The British case is unique in that they were the first of the allied powers to employ gliders in combat—providing a learning experience for US war planners. The chronology and format follows the same basic form as the previous chapter but focuses on some key differences and challenges unique to the UK. An examination of the UK glider operations at Sicily, Normandy, Holland, and the Rhine reveals the importance of gliders to the success of those operations. Again, the sources for this chapter are primarily secondary accounts. Noteworthy sources include *RAF Airborne Forces Manual: The Official Air Publications for RAF Paratroop Aircraft and Gliders, 1942-1946*,

G. G. Norton's *The Red Devils*, George Chatterton's *The Wings of Pegasus*, and Alan Wood's *History of the World's Glider Forces*.

Chapter 4, *The United States Gliders*, forms the core of this research effort. This chapter relies heavily on primary sources to develop a view of US glider policy from its beginning through the end of World War II. It describes how the US began its journey into glider employment without clear doctrine, training, or even discrete goals. The first section of the chapter chronicles the dysfunctional procurement system that caused the US to pay extravagant prices for machines made of steel tubing and canvas. Intra-service disputes highlight the next section of the chapter, which describes the training of glider pilots and glider infantry. Key doctrinal differences reveal that the US had a fundamentally different view of glider employment when compared to Germany and the UK. Finally, the chapter examines US glider operations of in the European theater of operations. A few sources provide the foundation for the research including the Peter Harclerode's *Wings of War: Airborne Warfare 1918-1945* and Ridgeway's *Paratroopers: The American Airborne in World War II* authored by Clay Blair. Additionally, James A. Huston's *Out of the Blue* examines the role of doctrine in the emerging airborne and glider forces.

Chapter 5, *Gliders in China-Burma-India*, builds on the foundation of Chapter 4 but provides the perspective of glider employment in the China-Burma-India (CBI) Theater. This chapter primarily focuses on the different doctrine and application of US and UK gliders compared to the European theater. The CBI Theater differed greatly from the war in Europe and consequently provided a different application for military gliders. In fact, this was the only theater that experienced the consistent recycling of gliders from mission to mission. James Mrazek's *The Glider War* and John L. Lowden's *Silent Wings at War* are two secondary

sources that provide the historical accounts of glider operations in this theater.

Chapter 6, *Where Did the Gliders Go?*, examines the demise of the US military glider in the post-World War II era. This chapter describes the emergent US Air Force culture fascinated with jet aircraft and nuclear weapons and the US Army culture focused on helicopter and airborne operations as two primary contributors to the termination of the glider program. Key shifts in US defense policy and the ensuing budget battles did not bode well for a glider program that did not have sponsorship from any particular military branch. The final part of the chapter describes the actual cost of the glider program, which made it an easy target for cancellation following World War II. This chapter relies heavily on Raymond J. Snodgrass' "The AAF Glider Program November 1944-1947" and Robert Futrell's *Ideas, Concepts, and Doctrine: Basic Thinking in the United States Air Force 1907-1960*. The former outlines the procurement, training, and combat application of the US glider program while the latter provides a good account of the USAF's views as it emerged as a separate service in September 1947.

Chapter 7, the final chapter of this thesis, pieces together the tiles of the mosaic in a conclusion that summarizes the contributions of the glider in World War II. These contributions vary considerably based on the expectations of the countries that employed gliders. Additionally, this chapter postulates the gliders' potential impact on contemporary military problems and attempts to answer the question: Does the military glider have an application in the modern battlefield? Furthermore, is the glider simply a relic of the past or are conditions in the emerging asymmetric battlefield ripe for its return? Weapon systems, even those with considerable merit and no suitable replacement, can die a premature death.

Chapter 2

German Gliders

Our whole future is in the air. And it is by air power that we are going to recapture the German empire. To accomplish this we will do three things. First, we will teach gliding as a sport to all our young men. Then we will build up commercial aviation. Finally, we will create the skeleton of a military air force. When the time comes, we will put all three together—and the German Empire will be reborn.

Hermann Goering

Early Beginnings

Although there was certain interest in gliding in other countries during the interwar period, it was in Germany that the sport had its most extensive and advanced development. So important was aviation and gliding to the rebuilding of the German empire, the German government choose to subsidize and sponsor glider research, training, and development almost immediately after the end of World War I, despite the crippling economic sanctions imposed by the Versailles Treaty. However, necessity and not pure choice surely increased the interest in gliding as the consequences of the Versailles Treaty left little opportunity for the average German to channel their enthusiasm for flying except through gliders.² The energies of a nation that would normally have been devoted to powered flight were expended on gliding, which led to interesting consequences.³

The government, strongly influenced by Goering's viewpoint, encouraged all young Germans to fly. As the interest in glider flying

² James S. Corum, *The Luftwaffe: Creating the Operational Air War, 1918-1940*, Modern War Studies (Lawrence: University Press of Kansas, 1997), 112. Although the Versailles Treaty denied Germany an air force, it placed no restrictions on civil aviation or aviation technology. However, civil aviation was expensive and gliding support seemed a cost-effective means of promoting an air-minded society.

³ James E. Mrazek, *The Glider War* (New York, NY: St. Martin's Press, 1975), 27.

increased, the German government founded the *National Socialistische Flieger Corps* (NSFC). Its purpose was to organize flying activities and provide standardization and certification to aspiring pilots. The NSFC supplied the facilities and training for those young men who would not have otherwise have been able to take up glider flying and later provided the administration that would later supply the German *Luftwaffe* with qualified glider pilots. It kept the records of all the pupils, gave tests, and issued proficiency certificates. The NSFC also encouraged independent organizations, especially those with facilities such as gymnasiums and universities, to establish glider clubs at their own expense. These clubs eventually came under the supervision of the Reich's *Luft Ministerium* (Air Ministry).⁴

Many German glider pilots began their training at very young ages. After 1933, a large pool of glider trainees came from the *Hitler Jugend* (Youth) organization. The *Hitler Jugend* allowed boys at the age of ten to join and its leaders encouraged boys to build and fly model aircraft—instilling the early fundamentals of aerodynamics. Later, at the age of fourteen, a boy qualified for the *Flieger Hitler Jugend* and began receiving instruction in open-air and closed cockpit gliders. Work with either the *Flieger Hitler Jugend*, the NSFC, or the university glider clubs, qualified youth elementary glider certification. This certification provided the necessary qualification for advanced glider training, which culminated in the award of a gliding certificate that became the prerequisite for formal glider training in the *Luftwaffe*. In fact, so many young Germans trained to this standard in various gliding clubs, that the *Luftwaffe* had a wide choice of trained personnel and thus obviated the need for elementary glider training.⁵

The glider's transformation from a civilian sport to a military application began during the period of 1930 from 1933, when German

⁴ Mrazek, *Glider War*, 28.

⁵ Mrazek, *Glider War*, 28.

officials developed a flying observatory glider used for high-altitude meteorological readings. It was in this service that the glider gained its first military supporter in General Ernst Udet, who saw in its design and performance the possibility unique military applications. He envisioned gliders bringing supplies to encircled units or even to “serve as a kind of a modern Trojan Horse, by landing soldiers unnoticed behind an enemy’s front lines.”⁶ Furthermore, German leaders speculated that the total cargo lift capacity of an airplane could be nearly doubled using a transport glider in tow. The Germans believed that gliders offered all of these advantages along and the additional benefits of low-cost production, ease of manufacture, and expendability.

Senior *Luftwaffe* generals began to press for a combat glider model. Germany, eager to protect their potential weapon, gave the design and development of the glider project a ‘secret’ classification from the beginning. The project became the focus of an aircraft engineering company, *Deutsche Forschungsanstalt Fuer Segelflug* (DFS), which with the help of glider pilots on staff, created the first military assault glider of World War II—the DFS 230.⁷ As the DFS 230 and larger, follow-on models became operational, German leaders treated gliders as combat aircraft and not just troop transports. Germany went as far arming every glider with machine-guns—the only country to do so in World War II.⁸ Although viewed as a combat aircraft, many controversies developed over the tactical doctrine of glider operations.

Doctrine

One of the most innovative aspects to air doctrine developed in Germany in the interwar period was the establishment of a *Luftwaffe* airborne force (which eventually included glider troops). Lieutenant General Walter Wever, first chief of staff of the *Luftwaffe*, created the

⁶ Mrazek, *Glider War*, 30-31.

⁷ Mrazek, *Glider War*, 31.

⁸ James E. Mrazek, *Fighting Gliders of World War II* (New York, NY: St. Martin’s Press, 1977), 25-27.

airborne force after observing the Soviet use paratroops in several exercises from 1933-35.⁹ When Wever ordered the creation of an airborne force, the initial doctrine for the force was to use small units of platoon size to drop behind enemy lines to seize or destroy vital targets and enemy installations.¹⁰ This application of *Luftwaffe* paratroopers in a commando role was different from the vision of the German army, which saw paratroopers as conventional infantry who simply arrived at the battle in a different way.¹¹ The *Luftwaffe* and army developed two paratroop forces along these divergent lines until *Reichsmarshall* Hermann Goring, German Air Force Commander in Chief, convinced Adolph Hitler that the *Luftwaffe* should have sole command and control of all paratroops. Goring's argument centered on the efficiency of having the paratroops and their delivery assets under one organization. In July 1938, German leaders transferred all paratroops and their equipment to the *Luftwaffe*—the only World War II power to align gliders, paratroops, and delivery vehicles under one service. For the task of leading this new capability, the *Luftwaffe* selected Major General Kurt Student, who took command of the airborne forces on 1 July 1938.¹²

General Student set out to make the airborne concept a reality but first had to settle a doctrine dispute of the role of paratroops in combat. He effectively summarized his views after World War II:

I could not accept the saboteur concept. It was a daredevil idea but I did not see minor operations of this kind worthwhile—they wasted individual soldiers and were not tasks for a properly constituted force...From the very beginning, my ideas went much, much further. In my view (sic) airborne troops could become a battle-winning force of prime importance.

⁹ Corum, *Luftwaffe*, 169.

¹⁰ Volkmar Kühn, *German Paratroopers in World War II* (London: Ian Allen Limited, 1978), 14.

¹¹ Chris Mason and United States Marine Corps Command and Staff College, *Falling from Grace: The German Airborne in World War II* (Quantico, VA: United States Marine Corps Command and Staff College, 2001), 6.

¹² Kühn, *German Paratroopers*, 16.

Airborne forces made three-dimensional warfare possible in land operations. An adversary could never be sure of a stable front because paratroopers could simply jump over it and attack from the rear when and where they decided...airborne troops provided a new means of exploitation and so their potential in such operations was of incalculable importance. The element of surprise was an added consideration; the more paratroops dropped, the greater the surprise.¹³

General Student solved the great debate of airborne doctrine by emphatically stating that paratroops have a role as conventional infantry. However, this was not to be the last controversy over airborne doctrine.

Glider operations doctrine evolved in conjunction with parachute operations doctrine. Beginning in the early 1930's, German military forces experimented extensively with parachuting and developed combat tactics for airborne operations. The Germans also realized that landing men in a glider had certain advantages over dropping them by parachute. First, the glider had the advantage of landing a unit of men together and ready to fight. In contrast, parachuting scattered soldiers over large areas, which caused difficulties in assembling units and loss of time getting to the objective. Secondly, parachute troops could sustain substantial losses assaulting a heavily defended area. In contrast, gliders landed quickly and the men were ready to fight upon landing, with weapons and without having to escape a cumbersome parachute harness. Next, gliders were silent. They released from their tow aircraft miles from the target and potentially could land without detection—an element of surprise rarely achieved by parachute troops and their transports. Finally, gliders were relatively cheap. Since the cost of making parachutes from expensive silk was so high, German planners believed that the cost of a wooden glider that carried ten men could be manufactured for roughly the same price as ten parachutes—around

¹³ Kühn, *German Paratroopers*, 16.

7,500 Deutsche Marks.¹⁴ Since combat parachutes and gliders are seldom reused, the cost of delivering troops via parachute or glider was the same. Despite all of these relative advantages, gliders, as a component of the airborne forces, still lacked a clear, definable mission set in the over-arching construct of Germany's *Blitzkrieg* doctrine.

General Student immediately set out to define the role of his new airborne division. He expanded the concept of the airborne division to include three different types of forces: paratroops, glider troops, and air-landing troops. All of these forces, along with accompanying gliders and transport aircraft, comprised the 7th *Flieger* Division.¹⁵ Student envisioned these new forces deploying in three, distinct, but often parallel, waves. First, a small force of glider-borne troops would land close to key tactical elements such as road junctions and bridges, anti-aircraft batteries, and command and control centers to neutralize, destroy, or hold them. Almost simultaneously, paratroops would drop to secure additional key geographical or military objectives and reinforce the glider troops. Student believed that the paratroops should be airdropped over a large area initially, not concentrated, on the battlefield. This “drops of oil” concept meant that groups of parachutists would land in several places and like drops of oil spread in different directions until they merged.¹⁶ Lastly, as the first two forces secured an airfield, the air-landing troops landed on the airhead to expand outwards and eventually link up with conventional land-based forces.¹⁷ The *Luftwaffe* could now undertake airborne operations without reference to the army in planning or assistance in execution. With only a few exceptions, airborne operations undertaken during the period 1939-1945 were the sole

¹⁴ Mrazek, *Glider War*, 31.

¹⁵ James Lucas, *Storming Eagles German Airborne Forces of World War Two* (London: Arms and Armour Press, 1988), 12.

¹⁶ Mason, *Falling from Grace*, 14.

¹⁷ Mason, *Falling from Grace*, 11.

responsibility of the *Luftwaffe*.¹⁸ Student's concept of airborne warfare was to surround the enemy and force them to defend everywhere at once. However, this revolutionary vision of airborne warfare required competent glider pilots and dependable machines.

Pilots and Training

The popularity of gliders in Germany in the interwar period provided the *Luftwaffe* with a large inventory of trained personnel. The depth of civilian expertise was so great at that the *Luftwaffe* did not establish a basic glider school until after 1940. The only prerequisite required of glider pilots was to hold a Class II certificate. This certificate called for twenty hours of flying, including a minimum of twenty flights of not less than a minute each, in a basic two-seater glider.¹⁹ By 1939, the *Luftwaffe* had absorbed all of the glider pilots from the German army and training began for their first tests in combat.²⁰

German glider pilot training focused on flying and fighting with much of the training taking place in the combat glider unit. The six-week flying training emphasized spot landings, a critical aspect that allowed the seizure of key targets quickly, and blind flying, an important skill to maintain position behind the tug aircraft. German glider pilots, unlike some of their American counterparts, expected to fight as infantry upon landing and therefore received standard infantry training in addition to their flight training.²¹ This led to an close bond between a pilot and his cargo. With a silent approach, close grouping, and spot landing, glider troops moved efficiently into action, often tearing through the canvas covering of the glider in their zeal to unload and begin the assault. However, zeal alone would not guarantee success—the

¹⁸ Roger Edwards, *German Airborne Troops 1936-45* (Garden City, NY: Doubleday & Company, 1974), 69.

¹⁹ Mrazek, *Glider War*, p.28

²⁰ Edwards, *German Airborne Troops 1936-45*, 51.

²¹ Edwards, *German Airborne Troops 1936-45*, 51-52.

appropriate machines were an absolute priority requirement to achieve success.

Machines

Although Germany experimented with many military gliders in World War II, only three gliders saw the bulk of the action--the aforementioned DFS 230, the Gotha (Go) 242, and the Messerschmitt (Me) 321. These gliders demonstrated a progression in German glider design—one of bigger payloads and technical innovations.

The DFS 230, the first military assault glider of World War II, served as the centerpiece of German glider operations, including the famed assault on Fort Eben Emael. The DFS 230 featured high wings made of stressed plywood and a fuselage of steel tubing wrapped in canvas. It held ten troops including the pilot. The seats were in a straight line with six facing forward and four to the rear. The rear seats were removable to accommodate cargo instead of personnel. Its wheels were jettisonable in flight and later landed on a central ski that extended from the nose to the middle of the belly. The DFS 230 had a towing speed of 120 miles per hour, featured one machine gun for protection, and had a maximum cargo weight of 2,800 pounds. Its greatest strength was its noiseless approach yet its slow flight made it an easy target to prepared defenses. Additionally, its simple construction often broke up in rocky terrain landings. Normally towed by the three-engine workhorse Junkers (Ju) 52 cargo transport airplane, the DFS 230 was light enough to be lifted into the air by a single Bf 109. This procedure fixed the glider directly underneath the fighter until it was released at the desired point, which allowed the Bf 109 to protect the DFS 230 during its descent.²² Its early successes drove the *Luftwaffe* to seek larger gliders that were capable of carrying more men and material.

²² Mrazek, *Fighting Gliders*, 27-30; and Edwards, *German Airborne Troops 1936-45*, 44-45.

Germany introduced the Gotha 242 in 1942 as a freight glider to carry large amounts of bulky cargo unsuitable for the smaller DFS 230. Used extensively between Europe and North Africa, the Go 242 could carry twenty-three troops (including two pilots) or up to 8,000 pounds of cargo. This high-winged, twin-boom monoplane had provisions for mounting eight machine guns but only four were fitted at one time. Unlike the small side door of the DFS 230, the Go 242 featured a hinged rear door to facilitate loading and unloading. Its extra cargo room made it extremely flexible as the Germans used it in a number of different roles such as a transportable maintenance center with lathes and other machinery installed. Its durability even allowed for wing-mounted rocket propulsion, which aided the Ju 52 tow plane during takeoff. Despite its improved payload compared to the DFS 230, the Go 242 could not carry a heavy tank or a 88 millimeter anti-tank gun each of which were critical to success of troops landed for sustained operations.²³

The Me 321 *Gigant* (Giant) was the largest operational glider built in World War II. Designed to carry heavy tanks and anti-tank weapons as part of an airborne invasion of England, this massive glider could carry twenty-two tons of equipment or 200 fully equipped troops and featured a clamshell-style front door that allowed rapid loading and unloading. During initial empty-weight flight tests, the engineers realized that because of heavy weight, only the Ju 90, a converted *Lufthansa* airliner, was powerful enough to get the glider airborne. Since no single aircraft was capable of towing a fully loaded Me 321, Messerschmitt developed a 'Troika tow' in which three individual aircraft hitched to the glider via tow rope. The Bf 110 proved successful in this configuration but the experimentation proved hazardous, as many airplanes and pilots were lost. To solve the towing problem, Germany built a special tug, the Heinkel (He) 111z. This aircraft joined two

²³ Mrazek, *Fighting Gliders of WWII*, 32-37; and Edwards, *German Airborne Troops 1936-45*, 47-48.

standard He 111's by a center wing section where an additional three engines resided. The result was a five-engine behemoth with two cockpits. After the cancellation of the England invasion, most Me 321s participated in the eastern offensive against the Soviet Union, delivering men and material to the war front. Later, a six-engine super-transport developed from the Me 321, the Me 323, proved to be highly vulnerable due to its slow speed as Allied fighters shot down fourteen 323s during a Tunisian supply operation in 1943.²⁴

From its early beginnings as a sailplane to the evolution of the Me 321, the German glider played a vital role in the early military successes of World War II. The innovation and adaptation of gliders throughout the war demonstrated the German commitment to its combat applications, which would begin early in World War II.

Capture of Fort Eban Emael

At 0505 on 10 May 1940, a mile east of Fort Eban Emael in Belgium, sturdy *Luftwaffe* gliders, heavy with glider troops, guns, and secret explosives, cut away from their Ju 52 tow-planes and descended down to their objectives.²⁵ The glider assault, the first-ever in combat, consisted of twenty-nine (two gliders aborted and did not make their objectives) DFS 230 gliders with four objectives: Fort Eban Emael (Objective Granite), Vronhoeven Bridge (Objective Concrete), Veldvezelt Bridge (Objective Steel), and Canne Bridge (Objective Iron).²⁶ These targets, vitally important to Germany's march west, were the centerpiece of the Sixth Army's planned advance through Belgium, Holland, and France.²⁷ The fort was the most important of the objectives as its large

²⁴ Mrazek, *Fighting Gliders of WWII*, 37-42; Edwards, *German Airborne Troops 1936-45*, 45-47.

²⁵ Mrazek, *Glider War*, 21.

²⁶ Alan Wood, *History of the World's Glider Forces* (Wellingborough, England: Patrick Stephens Ltd., 1990), 20; and William H. McRaven, *Spec Ops Case Studies in Special Operations Warfare: Theory and Practice* (Novato, CA: Presidio Press, 1996), 37.

²⁷ James Lucas, *Kommando: German Special Forces of World War Two* (New York, NY: St Martin's Press, 1985), 53.

guns commanded the axis of advance from Maastericht across the Meuse River. Fort Eban Emael is where the first German gliders landed, which began Germany's advance into Western Europe.

Despite taking anti-aircraft fire, nine gliders landed within yards of their targets at Fort Eban Emael.²⁸ In their eagerness to attack the casemates at Objective Granite, troops catapulted out of the glider doors and even burst through the fabric sides of the aircraft. Within the first twenty minutes, the decisive struggle was over. German sappers, with their hollow charges, systematically destroyed Belgian casements, neutralizing the big guns of Fort Eban Emael and trapping its inhabitants inside. Meanwhile, German pilots superbly landed their gliders near the other objectives allowing the glider troops to capture two of the three targeted bridges intact. By 1300 hours on 11 May 1940, the Belgian soldiers defending the fort surrendered. Germany's first use of the glider produced a resounding military victory.

The speed at which the Germans seized Fort Eban Emael jarred and baffled World War I-oriented generals and politicians, for the swiftness and shock-power of the attack was like nothing seen before. Adolph Hitler, realizing the potential of the glider weapon, clamped tight security in the aftermath of the capture. German propaganda covering the victory did not show gliders or hollow charges, leaving the impression that it was a conventional military operation. The rapid fall of Fort Eban Emael further strengthened the idea of German invincibility in the minds of many Allied leaders.²⁹ In the end, sixty-nine German troops arriving on eleven gliders on or near Objective Granite engaged and soundly defeated a Belgian force ten times their size in a little more than twenty-

²⁸ McRaven, *Spec Ops*, 48-50. Eleven gliders were to assault Objective Granite. One glider containing Squad 1 and Objective Granite commander, Lieutenant Witzig, broke free before the release point and landed in Germany. Another glider, carrying Squad 2, released too soon and landed short of the objective. Both squads of glider troops eventually made it to Fort Eban Emaul and took part in its capture.

²⁹ Mrazek, *Glider War*, 26-27.

four hours.³⁰ The glider assault on Fort Eben Emael, in conjunction with widespread airborne operations in Holland and Belgium, opened the way for German armor to drive through the Low Countries into France.³¹ Adolph Hitler and General Kurt Student, impressed by German glider and airborne success, were eager to employ their new weapon again.

Greece-Corinth Canal and Operation Merkur (Mercury)

Less than a year after the operations in Belgium, General Student and his airborne staff saw Greece as another opportunity to use gliders. The first opportunity occurred when the Greek Army surrendered in April 1941. This surrender left the British, Australian, and New Zealand contingent that had come to the aid of the Greeks in a precarious position as the only withdrawal or evacuation available was now by sea. The Germans, realizing that the British Commonwealth troops needed access to ports, drove rapidly to seize the major ports east of Athens. With these ports captured, the last viable evacuation ports were one hundred miles to the south. These last options required Commonwealth forces to cross the sandy narrow Isthmus of Corinth. The Germans believed that capturing the Corinth Canal Bridge would completely cut-off evacuation and split the resistance in two—leaving Commonwealth troops trapped between Athens and Corinth and the remaining element isolated on the Peloponnesian peninsula. The entire plan hinged on a rapid capture of the Corinth Bridge, a task given to six gliders and parachute reinforcements.³²

As in the assault on Fort Eben Emael, the German gliders were successful in capturing their main objective. Prior to the glider assault, German airplanes bombed and strafed Allied positions in an attempt to neutralize anti-aircraft fire. As the gliders approached their destinations, the defenders, thinking the approaching gliders to be another flight of

³⁰ McRaven, *Spec Ops*, 55.

³¹ Mason, *Falling from Grace*, 16.

³² Mrazek, *Glider War*, 64-66.

bombers, ducked into their emplacements without massing anti-aircraft fire. Within minutes of landing, the glider troops took eighty prisoners and seized the canal bridge. However, the celebration was short-lived as German miscommunication allowed a well-placed Allied 40-mm shell to detonate the explosives still attached to the bridge.³³ Although the Germans intended to use the bridge to further their attack, its destruction, nevertheless, blocked the Commonwealth's withdrawal route. In the end, some 10,500 troops were cut-off and Germany occupied the entire Corinth Isthmus less than four days later.³⁴ This success encouraged German military planners to prepare glider and airborne forces for its largest operation yet—the invasion of Crete.

With the mainland of Greece secure, Crete remained a stronghold for Allied forces in the Eastern Mediterranean. German war planners deemed Crete an essential stepping-stone to the capture of the Suez Canal. The assault on Crete, codenamed Operation Mercury, began on 20 May 1941. The plan called for a large glider assault, two airborne assault waves, and an air-landing wave, which was consistent with Student's doctrinal vision. Gliders would capture key terrain and geographic features, airborne troops and their 'oil-drop' methods would control airfields, and air-landed troops would provide reinforcements.³⁵ General Student, now commander of XI Flieger Korps, finally had an opportunity to demonstrate the complete capabilities of his forces on a large scale.

Despite an ultimately successful operation, the invasion of Crete proved to be a disastrous event for German airborne forces. Student's forces, expecting as few as 5,000 defenders, in fact, faced over 27,500 well-armed, first-rate Commonwealth troops plus an additional 14,000

³³ Peter Harclerode, *Wings of War: Airborne Warfare 1918-1945* (London: Weidenfeld & Nicholson, 2005), 64.

³⁴ Mrazek, *Glider War*, 68-69.

³⁵ Edwards, *German Airborne Troops*, 82.

Greek forces.³⁶ Altogether, the Germans were outnumbered five-to-one. The over-water glider flight to Crete was a grueling ordeal as several gliders separated from their tugs and crashed in the sea. In fact, the new commander of 7th *Flieger* Division, Lieutenant General Wilhelm Suessman was killed when his glider crash landed on the island of Aegina, short of Crete.³⁷ Unlike the attack on the Corinth Canal Bridge, the defenders of Crete delivered punishing small arms fire on the descending gliders. In total, seventy-two gliders were part of the invasion force. Of these gliders, sixty-one gliders landed close enough to their objectives to be effective and only 40 percent of the glider troops accomplished their assigned missions.³⁸ In total, Germany's Pyrrhic victory cost 6,000 dead from a force of 22,000 and destroyed more than 250 transport airplanes.³⁹

Back to the Future—Commando Raids

Adolph Hitler, who had taken an early interest in airborne forces, declared to General Student two months after the Battle of Crete that the day of the parachutist was over. In Hitler's opinion, airborne forces had lost their greatest tactical skill—the element of surprise. Consequently, Germany did not attempt any large airborne operations after Crete but Hitler's edict did not stop the use of gliders. Gliders saw continued use in an aerial resupply role, especially on the Eastern Front, and in several smaller commando-type operations.

Germany, unwilling to use gliders in large-scale assaults after Crete, used them in numerous smaller operations. One of the most interesting commando uses of gliders was the rescue of Benito Mussolini from his Italian captors at the Albergo Rifugia ski resort hotel. The hotel, perched on top of a 9,050-foot-high peak of the Gran Sasso Massif in the

³⁶ Mason, *Falling from Grace*, 22.

³⁷ Mrazek, *Glider War*, 72.

³⁸ Mrazek, *Glider War*, 77.

³⁹ Edwards, *German Airborne Troops*, 96.

Apennines, was nearly inaccessible to a conventional assault.⁴⁰ Operation Oak, a glider assault, was the only option since the Italians were defending the only over-land approach to the hotel and the high altitude ruled out a possible parachute assault. Germany chose SS Major Otto Skorzeny to lead the glider assault on the compound. Despite several difficulties, including losing part of the assault force because of Allied bombing at the departure airfield, the mission proved successful.⁴¹ The assault force crash-landed their gliders within meters of the hotel, allowing the paratroopers to overwhelm the Italian defenders and rescue Mussolini.⁴² The surprise and silence of the glider combined with the relatively low loss of life (only ten killed or wounded), proved that the glider was a useful instrument in small, commando operations.⁴³

Later in World War II, Germany's attempt to capture Yugoslavian Marshal Josip Tito, did not prove as successful as the liberation of Mussolini. Operation Rösselsprung, or Knight's move, centered on capturing Tito, to quell the resistance in the Balkans that was tying up German troops needed elsewhere. The glider, once again used in a commando role, accomplished its task of delivering men to Tito's suspected location. Unfortunately for the Germans, Tito had been relocated weeks earlier.⁴⁴

The final glider operation of the German airborne force is a remarkable demonstration of ability and courage. In February 1945, two airborne battalions landed in the fortress city of Breslau to reinforce its beleaguered defenders. The city, surrounded by the Soviets, offered little in the way of landing area. The German's overcame this difficulty by attaching a parachute to the tail of a glider. The glider released over Breslau, deployed its parachute, and descended nearly vertically to land

⁴⁰ Wood, *History of the World's Glider Pilots*, 28.

⁴¹ Mrazek, *Glider War*, 266-267.

⁴² Wood, *History of the World's*, 29.

⁴³ McRaven, *Spec Ops*, 188.

⁴⁴ Mrazek, *Glider War*, 268-269.

on the city's main street.⁴⁵ Alas, this extraordinary tactic was not enough to save the city as it fell three months later; effectively ending the German employment of gliders in World War II.

Conclusions

The military glider found its first application and uses in Germany. Under the leadership of General Kurt Student and with support of Adolph Hitler, the Germans were able to transform the glider, curiosities of the 1920's and 30's, into an effective element of airborne warfare. With the single exception of Crete, Germany never used gliders in large numbers as envisioned by Student. Gliders found their most effective role in small, surprise attacks behind enemy lines, a role that Student did not advocate in his early visions.⁴⁶ Yet, it was in these special operations missions that the glider contributed most to success.

Ironically, the costly victory in Crete caused the German airborne and glider troops to lose favor with their highest advocate—Adolph Hitler. One of the glider's greatest assets was its ability to surprise—an ability that Hitler proclaimed as lost after Crete.⁴⁷ The losses on Crete, while high in personnel, also crippled the German transport fleet on the eve of the invasion of Russia.⁴⁸ Germany struggled to recover from losing nearly half of its transport fleet, which undoubtedly contributed to the decline in glider operations. Lastly, a monumental shift in airborne troop employment thwarted the use of gliders. Germany never pursued Student's doctrine of vertical envelopment after Crete. Student's men fought as conventional infantry for the remainder of the war—reducing,

⁴⁵ Lucas, *Storming Eagles*, 179.

⁴⁶ Jonathan C. Noetzel and Air University (U.S.), Air Command and Staff College, School of Advanced Airpower Studies, *To War on Tubing and Canvas: A Case Study in the Interrelationships between Technology, Training, Doctrine, and Organization* (Maxwell AFB, AL: 1993), 17.

⁴⁷ Callum MacDonald, *The Lost Battle of Crete 1941* (New York: The Free Press, 1993), 301.

⁴⁸ Williamson Murray and Air University (U.S.), Airpower Research Institute, *Strategy for Defeat: The Luftwaffe, 1933-1945* (Maxwell AFB, AL: Air University Press, 1983), 93; and MacDonald, *Lost Battle of Crete*, 301. Germany lost nearly two hundred transport aircraft in Crete out of only 444 available.

almost eliminating the need for gliders in an assault role.⁴⁹ Germany, first to demonstrate the unique capabilities of gliders in World War II, was not the only one to use them as Allied forces quickly created their own glider forces.

⁴⁹ MacDonald, *Lost Battle of Crete*, 301.

Chapter 3

British Gliders

We ought to have a corps of at least 5,000 parachute troops, including a portion of Australians, New Zealanders, and Canadians, together with some trustworthy people from Norway and France...advantage of the summer must be taken to train these troops, who can nonetheless play their part meanwhile as shock troops in home defense. Pray let me have a note from the War Office on the subject.

Winston Churchill

Early Beginnings

Britain developed a rich background of civilian experience in sport gliding during the inter-war period. As the fascination with flying expanded in the 1910s and 1920s, soaring began to take hold in England and by 1929, the first gliding association formed. Three years later the enthusiasm for gliding was enough that the British gliding association sponsored an international competition. This competition drew glider experts and enthusiasts from over the world and most notably gained the attention of Germany. German glider pilots even sought training from British experts in the late 1930s, although these pilots might have been just as interested in the terrain and military objectives in southern England as the instruction they received.¹ While not officially sponsored or funded by the government, Britain had a strong civilian glider program prior to World War II.

Despite the civilian interest in gliding, British military leadership was apparently unmoved by its potential as a military weapon. The application of gliders in a military role was not unknown to Britain. In fact, as early as July 1934, the London magazine *Flight* carried an account and photographs of the Soviet GN-4 five-passenger glider built

¹ James E. Mrazek, *The Glider War* (New York, NY: St. Martin's Press, 1975), 39.

by Moscow Glider Works. This complacency, in regards to the application of gliders, is understandable as years of British history reinforced the idea that a strong navy alone could keep an invasion from their shores. The idea of a possible cross-Channel glider invasion by a Continental-based enemy seemed implausible and similarly British glider retaliation did not fit with current military or civilian thinking. Instead, if Britain needed to respond to an enemy preparing to attack via France, it would be the strong naval and the new strategic bombardment forces who would respond. Britain had little desire to engage its land forces in bloody battle especially if delivered from an unproven innovation derived from sport. It would take direct involvement from Britain's highest civilian leader, Prime Minister Winston Churchill, and early German successes to spur British military planners to consider the glider as a military weapon.²

As British Expeditionary Forces evacuated Dunkirk, Winston Churchill sent a brief instruction to his Chief of Staff in June 1940 that called for the creation of a 5,000-man parachute force with a proportionate glider element. It was a bold demand considering that Britain did not have an airborne or glider program and would be essentially starting from scratch. Additionally, Churchill stated that the new forces be ready to employ by spring of 1941—a mere nine months later. British military planners believing that more critical issues were at hand could have dismissed the idea had the instruction not been signed 'P.M.W.' or Prime Minister's wish. This caveat meant it was one Churchill's top priorities and nonnegotiable. Britain set out to create an airborne and glider force in less than a year—something that the Germans had six years to do.³

British gliders came into their own somewhat by default. Although Churchill had been quite definite about the number of paratroopers he

² Mrazek, *Glider War*, 39-40.

³ Mrazek, *Glider War*, 40.

wanted in the force, his intent for glider forces was not as clear. It was in the initial feasibility studies that military planners soon realized that Britain lacked adequate airlift capabilities to mass a large airborne force. Current inventories of aircraft could only carry a measly 800 men on a single airborne mission. Seeking a way to mass more troops in a single lift, military planners turned their attention to the glider. The glider, when towed behind an airplane, effectively increased the number of troops that airdropped on a single mission. Using the glider as an airborne paratrooper delivery system came closer to meeting Churchill's request of getting 5,000 men off the ground. An additional benefit of the completely wooden glider is that it delivered increased lift capacity without draining the already heavily committed engine and steel industries.⁴ These industries were busy producing long-range bombers and fighters, which the British felt, were their most urgent needs. Not only did Britain have to create an airborne and glider force from scratch, military planners needed tactical doctrine to govern and guide their employment.

Doctrine

Building an airborne and glider force from scratch meant that the British were creating capabilities absent of established doctrine. Neither the British military nor the civilian leadership had a clear vision to this new force's mission, role, or subsequent doctrine. The establishment of an airborne force was new to everyone in Britain, including its first commander Lieutenant Colonel Rock. The absence of experience and guidance frustrated Rock as he later confided, "It was impossible to get any information as to policy or task."⁵ Rock's background was that of a Royal Engineer whose training aligned closely with an infantry soldier. His acquaintance with aircraft was little more than that of a frequent

⁴ Mrazek, *Glider War*, 40-41.

⁵ G.G. Norton, *The Red Devils from Bruneval to the Falklands* (London: Martin Secker & Warburg Limited, 1984), 1.

passenger. He knew nothing of parachutes or gliders beyond that which he learned of the attacks delivered by Germany against Holland and Belgium six weeks before.⁶ Additionally, Rock and his RAF colleagues attempted to build an inherently offensive airborne and glider force when most of Britain's civilian and military establishments were centered on defense of the homeland. Lacking experience in airborne maneuvers, the British reluctantly began emulating the organization and doctrine of their bitter enemies—the Germans.

If the German successes with airborne and glider operations in May/June 1940 served as the wake-up to the British to begin organizing, equipping, and training a similar force, it was the German invasion and capture of Crete that solidified its eventual structure. Before the battle for Crete in May 1941 was over, Churchill cemented his vision of British airborne doctrine: "...We ought to have an Airborne Division on the German model, with any improvements which might suggest themselves from experience."⁷ The British moved quickly to follow the German model of airborne warfare by creating the Central Landing Establishment (CLE).⁸ In following the German model, the British began training three distinct types of troops consisting of parachutists, glider infantry, and air-land infantry. It was during the initial training at the CLE that British planners realized that gliders could do more than increase the number of paratroopers airdropped. Due to the lack of transport aircraft, military planners saw the glider as an airborne delivery vehicle, resupply tool, and as the primary air-land reinforcement method. British gliders would serve all in three roles in World War II.

In the early stages of airborne development at the CLE, military leaders learned that the weapons and equipment, which could be dropped by parachute, was extremely limited. Britain turned to

⁶ Mrazek, *Glider War*, 40.

⁷ Barry Gregory, *British Airborne Troops 1940-45* (Garden City, NY: Doubleday & Company, 1974), 7.

⁸ Gregory, *British Airborne Troops 1940-45*, 19.

converted bombers (mostly outdated Whitleys) to airdrop troops. These bombers barely proved sufficient for delivering troops much less equipment. Paratroops exited the bomber either through the removed rear gun turret or through a hole in the floor. Gliders were the only option for supplying airborne troops with the essential items such as jeeps, light tanks, Bren gun carriers, and artillery. Additionally, as Britain lacked large numbers of transport aircraft, gliders were the only means of flying in reinforcements to support the initial gains of the parachute landings. Gliders would in essence provide the air-land force to exploit and consolidate the early successes until the conventional ground army arrived.⁹ Similar to German doctrine, British doctrine rested on the dispersal of troops on the battlefield. Each decentralized group would fight independently until merging at an objective. Military planners, however, reconsidered this doctrine after some early trials and near catastrophes. Armed with initial airborne and glider doctrine, British military planners faced the unenviable task of training glider pilots who could master the intricacies of fighting in both the air and the land.

Pilots and Training

Unlike Germany, Britain did not have a large inventory of trained glider personnel prior to World War II. The first British glider training squadron formed in September 1940. The squadron consisted of Tiger Moth biplane aircraft as tugs and rudimentary civilian gliders. During this time, the British did not have any military gliders and an appeal went out to owners of civil gliders to loan to donate them to the start-up glider school. Fortunately, civilians answered the call and a mass of gliders arrived for training the new glider pilots. Glider pilot trainees continued training on civilian gliders until the first military glider, the Hotspur, began arriving in spring of 1941. As training progressed, the

⁹ Norton, *Red Devils*, 7.

demand for glider pilots grew resulting in a requirement to train 400 glider pilots in November 1941. This full-scale training program became the Glider Pilot Regiment.¹⁰

The Glider Pilot Regiment officially formed in December 1941 as a single battalion under the command of Lieutenant Colonel John Rock, with a second battalion to follow. Each battalion consisted of six companies of pilots. British glider pilots, similar to their German counterparts, trained to fight as infantry on the ground. However, unlike the Germans, British glider pilots belonged to the Army not the Royal Air Force (RAF). The British military attempted to alleviate some of the inevitable culture problems by recruiting both RAF pilots and Army infantrymen. Lieutenant Colonel (later Brigadier General) George Chatterton, second in command to Rock summarized the difficulties and importance of finding the right people for the new glider regiment as he addressed the first group of glider volunteers:

You (the volunteers) also are the first to form the Glider Pilot Regiment, a regiment without history or tradition, and at a time when we have experienced a series of bad defeats all over the world. This being the situation in the moment of defeat, we will forge this regiment as a weapon of attack...Now we consider ourselves to be unique in that not only will we be trained into pilots but also we will have to fight on the ground. Therefore (sic) we must be *total* (emphasis in original)—in all and everything. We shall fly, master all infantry weapons, drive tanks, jeeps and trucks...In fact there is nothing we will not train ourselves to do.¹¹

British glider training required a dual emphasis—ground and air. The RAF, however, provided only a supporting role by providing only the air portion of the glider pilots training with ground combat training a task of

¹⁰ Alan Wood, *History of the World's Glider Forces* (Wellingborough, England: Patrick Stephens Ltd., 1990), 36-38.

¹¹ George Chatterton, *The Wings of Pegasus* (London: Macdonald & Company Ltd., 1962), 22.

the Army.¹² Glider pilots, clearly delineated as soldiers first and pilots second, had an undoubtedly close bond with their cargo.

British glider pilot training consisted of two distinct tracts—one for first pilots and another for second pilots. First pilots, all of whom were staff sergeants, spent twenty weeks learning glider principles in various gliders, culminating in a qualification in the Airspeed Horsa glider. British second pilots, holding the rank of sergeant, received a shorter course of instruction with only eight weeks of training. Their respective wings on qualification denoted further distinction between first and second pilots. First pilots wore a brevet comprising a lion surmounting a crown between two blue wings while the second pilot wore a brevet comprising the letter 'G' between two blue wings.¹³ Despite this distinction, glider pilots of all calibers were only as good as the machines that brought them to battle. Britain hastily created these machines, just like their operators, in the crucible of war.

Machines

When the British realized that the crushing defeat and fortunate escape at Dunkirk began with the glider-borne surprise at Fort Eben Emael, they quickly took stock of their airborne doctrine and resources. The British, although entering World War II without a glider program, made remarkable progress in a short time. Starting from scratch, British industry produced gliders of high quality and quantity in a relatively short time. Just like their German opponents, Britain experimented heavily with different glider designs. Although many glider designs were tested and fielded, three gliders were the core of the British training and combat efforts including the Hotspur, the Horsa, and the Hamilcar. A fourth British glider, the Hadrian, saw considerable action in World War II. The Hadrian, although a key ingredient in the British glider force, was

¹² Wood, *History of the World's Glider Pilots*, 37-38.

¹³ Peter Harclerode, *Wings of War: Airborne Warfare 1918-1945* (London: Weidenfeld & Nicholson, 2005), 206.

actually a replica of the American CG-4A glider. Chapter 4 covers the CG-4A in more detail. Each glider, built for a unique purpose, demonstrated the British ability to adapt machine to purpose.

The Hotspur (Mark I, II, and III) was the first transport glider produced by the Allies in World War II. Its design was the stepping-stone from the civilian sailplanes of the 1930's to the enormous transport gliders fielded later in the war. Unfortunately, its design retained too many characteristics of the sailplane and failed to produce the characteristics necessary for troop and equipment transport. The Hotspur models had a narrow, oval fuselage that required the pilots to sit in tandem and could carry an additional six soldiers in the fuselage. The configuration of the Hotspur forced the six assaulters to sit in two separate cabins, one in front and one behind the wings.¹⁴ Exiting the glider was extremely tenuous, as the only exit was over the side of the glider after the soldiers in the cargo compartment dispatched the cumbersome fuselage lid. The Mark II variant attempted to alleviate the exiting problem by installing an exit door for each cargo compartment—allowing an airborne force to parachute from the glider. However, this innovation proved unsuccessful as airborne forces still had great difficulty exiting the glider due its cramped interior. Despite numerous modifications (including a twin Hotspur similar to the P-38 Lightning in design), the Hotspurs were never used in combat. Its relatively light cargo capacity and exit difficulties relegated the Hotspur to glider pilot training. The Hotspur glider, despite its many tribulations, propelled British designers to create bigger and stronger wooden-workhorses in World War II.¹⁵

¹⁴ Great Britain Air Ministry and Royal Air Force Museum, *RAF Airborne Forces Manual: The Official Air Publications for RAF Paratroop Aircraft and Gliders*, 1942-1946 (London: Arms and Armour Press, 1979), 233.

¹⁵ Wood, *History of the World's Glider Forces*, 155-157; and James E. Mrazek, *Fighting Gliders of World War II* (New York, NY: St. Martin's Press, 1977), 77-83.

The Horsa (Mark I and II) glider, originally designed as a paratroop transport, improved on the early efforts of the Hotspur. The glider's concept involved dropping paratroops over target while under tow and then returning to friendly territory. This method would effectively double the amount of troops per pass over the target as troops exited both the glider and the tug. Later modifications improved the Horsa's ability to carry equipment and the air-land method became the preferred mode of delivery. The Horsa carried up to twenty-eight troops and two pilots.¹⁶ Unlike the Hotspur, the Horsa could transport two Jeeps (quarter-ton trucks), a 75mm Howitzer and a truck, or an assortment of gear (including motorcycles) and ammunition weighing up to 7,380 pounds. The Mark II variant featured a hinged-nose that swung open for loading of cargo. The nose, however, was particularly vulnerable to damage upon landing, forcing innovative approaches to unloading men and machine on the battlefield.¹⁷

Determined to overcome the exit problems that plagued the Hotspur glider, designers of the Horsa experimented with ways to offload equipment and troops quickly on the battlefield. One innovative method involved removing the Horsa's tail section by means of a ring of Cordtex explosive inserted around the rear bulkhead. The explosive charge, when fired, cut the fuselage neatly dropping it to the ground. This method, however, proved risky as the explosive could damage the load carried and in flight, it was possible that enemy fire might set off the charge. Glider personnel subsequently abandoned this dangerous method opting instead for a more conventional innovation—the spanner or crescent wrench. Using a spanner, glider troops quickly loosened the bolts holding the tail section, allowing a rapid, rear exit. The Horsa, a marked improvement over the Hotspur, saw extensive action from November 1942 to the end of the war in Europe and its use continued into the

¹⁶ Great Britain Air Ministry, *RAF Airborne Forces Manual*, 238-239.

¹⁷ Mrazek, *Fighting Gliders*, 70-77.

1950s.¹⁸ Despite its cargo-carrying improvements, the Horsa could not carry a tank into battle which British war planners deemed vital to sustained operations in Europe.

The Hamilcar was the largest glider built by the Allies in World War II and provided the cargo capacity necessary to bring armor to the battlefield. The Hamilcar developed to support the commitment of large airborne forces; providing tanks, large guns and vehicles, large amounts of ammunition in an effort to give the paratroopers not just holding power, but a strong and aggressive punch.¹⁹ Its high-wing design combined with a nose-opening door facilitated the rapid offload of armored track vehicles.²⁰ Unlike most gliders with detachable wheels, the Hamilcar kept its wheels upon landing in order to clear landing strips, which prevented crowding on the landing zone. After finally coming to a halt, the Hamilcar simply released the pressure in its landing struts allowing it to sink on its skids. These unique modifications enabled its cargo to enter battle in as little as fifteen seconds upon landing.

Significant improvements in size and sturdiness allowed the Hamilcar to surpass the Horsa in cargo capacity. The Hamilcar could carry up to 17,500 pounds of cargo including a Tetrarch Mark IV tank or Locust tank, two Bren-gun universal carriers or two armored scout cars, a 25-pound gun with tractor, 40 troops, or similar loads of ammunition. Its massive size and weight posed a significant towing problem for the British. Already lacking a long-range cargo aircraft, Britain turned to its bomber force for towing duty. Although the Lancaster and Stirling bombers saw action as Hamilcar tugs, the Halifax bomber bore the brunt

¹⁸ Wood, *History of World's Glider Forces*, 160.

¹⁹ Mrazek, *Fighting Gliders*, 62.

²⁰ Great Britain Air Ministry, *RAF Airborne Forces Manual*, 241.

of duty.²¹ The Hamilcar finally brought the might of the British glider effort to bear against Germany.

Starting from a disadvantage compared to Germany, Britain demonstrated tremendous ingenuity and innovation in its glider construction within a very short time. Unlike the Germans, who rather quickly abandoned large-scale glider operations after one mediocre result, Britain remained committed the combat glider concept. Combat operations spanning from North Africa to Norway would soon test Britain's glider doctrine, training, and its machines.

Operation Freshman

The Germans occupied Norway in April 1940 and took control of the Norsk Hydro Electric Company's heavy water plant at Vermork, about sixty miles west of Oslo.²² German scientists needed this heavy water for their atomic research program, with their ultimate goal of producing an atomic bomb. In September 1942, British planners began making plans to destroy the Vermork installation. The attack, named Operation Freshman, was to be the first British glider-borne attack of World War II. The plan was for two gliders, towed from Britain, to carry an assault force to a landing zone six miles from the plant. Norwegian resistance using the secret Eureka beacons, which responded to the Rebecca receivers in the tug aircraft, would mark the landing zone. Each Horsa glider would carry fifteen men to destroy the heavy water stock. After destroying the stock, the assaulters were to escape via Sweden, some ninety-three miles away. Britain's first use of the glider in combat was not as an augmentation to airborne troops as British doctrine had intended, but was an operation that relied on stealth and surprise—doctrine more akin to the German capture of Fort Eben Emael.²³

²¹ Wood, *History of the World's Glider Forces*, 184-185.

²² Harclerode, *Wings of War*, 220.

²³ Wood, *History of the World's Glider Forces*, 46-47.

Operation Freshman failed in its objectives when both Horsa gliders missed the landing zone and one Halifax tug aircraft crashed into the mountainside. A combination of poor weather, faulty equipment, and inaccurate maps contributed to the tragedy. Severe icing caused the Rebecca receivers on the Halifax aircraft to malfunction forcing the tug aircrew to navigate at night visually with out-dated maps. Despite the tough conditions, both gliders released and made an attempt for the landing zone. Unfortunately, both gliders crashed killing the pilots and the majority of the sappers. German forces captured the survivors and later executed them in accordance with Hitler's infamous *Kommandobefehl* (Commando Order). This order, issued in October 1942, stated that all commandos be executed immediately without trial. Ultimately, Norwegian resistance destroyed Germany's heavy water cargo by blowing up a ferry in February 1944.²⁴ The disastrous results of Operation Freshman did not deter British planners from subsequent glider operations.

Operation Ladbroke

During March 1943, planning began for Operation Husky, the planned Allied invasion of Sicily. The invasion called for a seaborne invasion by the British 8th Army on beaches south of Syracuse on Sicily's east coast while the US 7th Army landed on beaches on Sicily's southern coast—effectively protecting the 8th Army's left flank. To facilitate the seaborne attack, Allied planners decided airborne and glider forces should be landed the night before to capture key bridges and road intersections. The British airborne landing, Operation Ladbroke, would consist of the 1st Air Landing Brigade with over 1,500 men. The objective of Ladbroke was the Ponte Grande Bridge, which spanned a canal, one and a half miles southwest of Syracuse. Additionally, the glider force would carry additional ammunition, jeeps, field guns, and mortars to

²⁴ Wood, *History of the World's Glider Forces*, 48.

reinforce the airborne troops. Since the British still lacked the sufficient number of gliders for the operation, Allied planners determined British pilots would fly American CG-4A Waco (British Hadrian) gliders. In all, the planned invasion force consisted of one hundred thirty-six Waco and eight Horsa gliders.²⁵

Although Operation Ladbroke was an eventual success, it was costly and inefficient. In Ladbroke, similar to Freshman, training and weather severely affected the results as only four of the gliders (out of an eventual assault force of one hundred thirty-seven) reached their intended landing zone.²⁶ A combination of inexperience and unfamiliarity hampered the glider pilots. The British glider pilots were new to the Waco glider and only had a few months to train in the new machine. Strong winds on the night of the attack caused numerous tug and glider pilots to misjudge their release points—resulting in many gliders landing in the water off the coast of Sicily. Yet, in spite of all of the problems, glider forces were able to achieve surprise and capture the Ponte Grande Bridge—transferring it to amphibious-landing 8th Army forces the following day. However, the results of this Pyrrhic victory were grave as casualties totaled 605 officers and men, a total that represented nearly one-half of the assault force.²⁷ Britain's two first major glider operations were troublesome in casualties and effectiveness. Yet, unlike the Germans who abruptly abandoned the airborne and glider concept after Crete, British military planners were determined to make it work. The enormous task of invasion of Europe provided another opportunity for the glider to prove its military worth.

D-Day / Normandy

Preparations for the invasion of Europe spanned three years and British military planners conceded airborne and glider forces would be

²⁵ Wood, *History of the World's Glider Forces*, 61-63.

²⁶ Mrazek, *Glider War*, 97-98.

²⁷ Mrazek, *Glider War*, 98.

vital to its early success. In preparation for the invasion, the Royal Army formed a second British airborne division, the 6th Airborne Division (AD) to augment the existing 1st Airborne Division. As D-Day approached, military planners gave the British and U.S. airborne forces the vital task of protecting the flanks of the arriving sea assault by seizing strategic points and communications centers to delay enemy movements to the beachhead. The 6th AD would secure the left flank of the invasion by landing in the area northwest of Caen and securing the bridges at the River Orne and Caen Canal while neutralizing the German coastal battery at Merville. Seizing the bridges would prevent a German thrust into the Allied flanks while neutralizing the guns at Merville would prevent them from raking the landing beaches. The gliders required for these three objectives, identified as the *coup de main* party, were in the first lift. The reinforcement gliders, including the Tetrarch-carrying Hamilcars, would bring in crucial heavy weapons and ammunition.²⁸ These additional resources were not available until the second lift because German obstacles on glider landing zones necessitated a first wave of parachute troops to clear and mark the landing zones²⁹. The British plan, marked by characteristic surprise and speed, was to test the men, the machines, and the doctrine of the glider forces.

The plan of attack to seize the bridges centered on surprise and precision for success. The mission, led by Major R.J. Howard, featured an assault force of six platoons carried to the objective on six gliders. Years of training combined with favorable weather conditions, led to great accuracy as five of the gliders landed on time with four gliders alongside the bridges. Surprise was so complete and the assault delivered with such precision that the enemy's defenses were overrun in brief, brisk action. Parachute troops, airdropped thirty minutes after the glider assault, quickly reinforced Major Howard's men. The bridges,

²⁸ Mrazek, *Glider War*, 183.

²⁹ Norton, *Red Devils*, 62-66.

captured intact, were held until the seaborne assaulters arrived on the evening of 6 June. The actions delayed German reinforcements against the main seaborne assault and offered British ground commanders a bridgehead to the west.³⁰

Similar to the attack on the bridges, the assault on the Merville gun battery consisted of parachute and glider troops. In this case, the parachute troops were the main assault force supported by follow-on glider forces. Despite some scattering of parachute troops and staunch German defenses, British assaulters neutralized the guns again with surprise and speed—but with marginal help from the glider forces. Of the three gliders meant for Merville, one did not arrive due to a broken tow-rope; the second landed one-half mile away; the third crashed in an orchard fifty yards from the gun battery. Fortunately, the third glider landed in a position to intercept a German platoon bent on reinforcing the gun battery and the glider troops were able to stop them.³¹ British gliders, eager to right past failures in Operation Freshman and Ladbroke, proved instrumental to the Allied success as they effectively opened the door for the invasion of Europe. However, even larger airborne operations were yet to come and these would test the limits of British glider operations.

Operation Market-Garden

In August 1944, General Bernard Montgomery proposed an Allied offensive through Holland that would cross the Rhine, isolate and occupy the Ruhr, and turn the Siegfried Line. The plan called for an “airborne carpet” along the Eindhoven-Arnhem road while seizing bridges intact. The ambitious operation relied heavily on the capture of several bridges intact and required airborne troops to operate for forty-eight hours unsupported.³² The operation, called Market-Garden, would become the

³⁰ Norton, *Red Devils*, 68-71.

³¹ Norton, *Red Devils*, 76.

³² Norton, *Red Devils*, 90-91.

largest airborne operation of World War II. Similar to the Normandy invasion, British gliders and parachute troops would work in close concert to seize objectives. However, lack of tug aircraft and the decision to conduct the operation in the daylight dampened the effectiveness of the operation. The lack of aircraft for tug and airdrop meant that the airborne / glider force arrived over a period of *days*—affording only the first wave the element of surprise. Secondly, unlike Sicily and Normandy, Market-Garden was a daylight operation. Lack of night glider training and stiff German night fighter capability drove the decision for daylight operations. Furthermore, heavy concentrations of anti-aircraft guns near the key bridges and populated areas moved drop and landing zones away from the objectives. Concentration of forces and movement to the objectives was to cost the assaulters both the element of surprise and precious time.³³

The final plan for Operation Market-Garden called for three waves over three days of glider and airborne troops. At 0945 on D-day, 17 September 1945, 359 British gliders destined for Holland took off from their bases in England. Despite the disadvantages of flying in the daylight, Allied air superiority protected the assault package and enabled 325 gliders to land. British glider troops and their pilots quickly secured every key objective, dug in, and waited for German counter-attacks with the eventual relief from the British 2nd Army expected. British glider pilots, trained as infantry, fought valiantly once on the ground. Glider operations continued through the entire operation and consisted mainly of equipment and ammunition re-supply operations. In total, Britain landed 621 gliders, 4,215 men, 1,026 vehicles, and 1,431 tons of supplies during Operation Market-Garden—making the contributions of the glider undeniable.³⁴ Unfortunately, the British 2nd Army's road to Arnhem took much longer than anticipated and the 1st Airborne Division

³³ Mrazek, *Glider War*, 200.

³⁴ Mrazek, *Glider War*, 198-223.

lost over two-thirds of their men. Despite the heavy losses, gliders proved invaluable as a means to surprise, envelop, and destroy the enemy.

Operation Varsity—Rhine Crossing

Early in 1945, the Allies agreed on a campaign to end the war against Germany. The plan included several airborne assaults on enemy positions across the Rhine River and British planners were determined to learn from the lessons of Arnhem. The design called for landing massive amounts glider troops, parachute troops, and supplies in just four hours, with scheduled resupply to follow in just six hours—instead of days after as in Market-Garden. It was the most enterprising airborne operation ever planned and in a doctrinal shift, airborne troops were to follow, not precede, the beginning of the ground assault. Furthermore, gliders were to land as near as possible to their intended targets, not spread out en masse. Tactical concentration, British planners believed, reduced the chance of enemy fire disrupting the attack before it began. This new technique landed an entire company in the same area and sought to place the gliders with the heaviest loads closest to the objective to facilitate offload of equipment. All of this was to be accomplished by moving 21,680 glider and parachute troops in a single airlift.³⁵

Tactical improvements helped make Operation Varsity a success. The 2nd Army and 9th Army began crossing the Rhine River in the early, dark hours of 24 March 1945. The glider and paratroop armada began landing in the early morning hours and by 1100, their major objectives were met.³⁶ Additional glider resupply and reinforcements continued to arrive to further press the beleaguered Germans. In the end, the Glider Regiment lost 101 men while landing 440 gliders in what was the last major glider operation of World War II.³⁷

³⁵ Wood, *History of the World's Glider Forces*, 142-143.

³⁶ Norton, *Red Devils*, 122-123.

³⁷ Wood, *History of the World's Glider Forces*, 149-154.

Conclusions

Despite a slow start and early losses, the military glider found its application and use in Britain. Initially constructed to follow the German model, British military planners soon adapted the glider to fit their particular needs. The military glider found a role in commando raids, troop concentrations, and resupply. However, it was never used in large amounts for its first intended use—airborne delivery of paratroopers. Yet, British commanders demonstrated the ability to learn from previous mistakes and executed a difficult, coordinated assault in Operation Varsity—the campaign that facilitated the collapse of Germany. Finally, Britain demonstrated resounding commitment to the military glider despite the failure of Operation Freshman and the costly victory of Operation Ladbroke. Brigadier General George Chatterton summed up the irony that existed between the German and British view on airborne and glider warfare: “As I was sitting fumbling with my hat and gloves in front of the General commanding the 1st Airborne Division, the fate of the German effort in this form of warfare was, in fact, being settled, and it is incredible to think now that we, the British, were only about to begin building up an airborne army, while the Germans had reached the point where, unknown to us, they were abandoning theirs because of the heavy casualties in Crete and the resultant drain on their crack troops.”³⁸ Pursuing an unproven glider and airborne capability, despite initial setbacks, served the British well in World War II.

³⁸ Chatterton, *Wings of Pegasus*, 19.

Chapter 4

United States' Gliders

The glider pilots themselves are a special breed of men. Not only were they required to be skilled airmen and wise in the vagaries of ground combat, they also had to have the full measure of guts to accept the hazards inherent in a one-way trip to a landing zone miles behind enemy lines.

Imagine, if you will, piloting a fully loaded glider being towed behind a modified transport or bomber aircraft through a turbulent, overcast sky at a thousand feet, and then gliding down through curtains of flak and small-arms fire to land in some farmer's potato patch...Now, imagine doing it at night, too.

*Matthew B. Ridgeway
General, U.S. Army (Ret.)*

Early Beginnings

While the Germans were developing the glider as a military instrument and were acquiring notable proficiency in its construction, American glider enthusiasts found little encouragement or support in official circles. As early as 1922, famed aircraft designer and builder, Glenn Curtiss, constructed a glider for military service. This pilot-less glider, however, was not to move men and equipment, but to serve as a target for ground and aerial gunnery. Over the next two years, Curtiss built thirteen gliders for the use of targets instead of conventional tow targets. The Air Corps did not seek any glider application beyond this mundane purpose. While the Air Corps acknowledged there was considerable enthusiasm for gliding in the United States and abroad, it did not direct any additional investigation into the military application of the glider. Gliding interest continued to grow in the US civilian community and by 1930, US glider associations sponsored national competitions. The civilian glider associations asked for US military participation in the competitions but were told abruptly by the Assistant Secretary of War that 'there exists no appropriation whereby an officer on

the active list could be dispatched to a duty as you mention.’ One year later, the Secretary of War established the official glider policy, stating that military glider flying was negligible and further expenditures of time and money into a US glider program was not warranted.¹ It seemed that the US, the nation that first took to powered flight, intended to pursue an aviation culture bereft of the glider.

Even as the evidence of the glider’s military utility mounted, US policy makers continued to ignore it. In August 1938, the War Department received a proposal suggesting that gliders could carry bombs or troops, or be effective as aerial torpedoes. Officials dismissed the idea by pointing out that the towing airplane could carry an equivalent load more efficiently and proclaimed, “The plan...of towing gliders as a practical weapon is not of sufficient military value to warrant further consideration and development.”² Military officials remained uninterested in the military application of gliders, which equated to no funding for research, procurement, or training. The US military glider program was destined to remain dormant until American military leaders learned of the extraordinary German success at Fort Eben Emael.

Despite strict German operational security measures, US military intelligence learned that Fort Eben Emael had fallen to a glider-borne force. US intelligence further learned through their military attaché in Bern that the Germans already had a large force of gliders and were prepared to move large numbers of troops and possibly tanks. Only twelve days after the receipt of the report from Bern, thousands of glider-borne German troops began the invasion of Crete.³ The German actions confirmed US intelligence but also signaled the glider’s substantial

¹ James E. Mrazek, *The Glider War* (New York, NY: St. Martin’s Press, 1975), 52.

² Mrazek, *Glider War*, 53.

³ S/Sgt Paul M. Davis and Amy Fenwick, “Development of Gliders in the Army Air Forces” Air Technical Service Command Documents (22 May 1945), 1, in the USAF collection, Air Force Historical Research Agency, and Mrazek, *Glider War*, 53.

military utility. US military planners, finally convinced of the glider's usefulness, hurriedly began to build a glider force.

As the evidence on German use of military gliders accumulated, a positive US glider policy began to emerge in February 1941. The policy, under the direction of General Henry H. Arnold, Chief of the US Army Air Forces, called for a study to develop a glider towed by aircraft.⁴ Arnold, eager to see results, directed a completion date of 1 April. His staff followed up Arnold's directive by issuing technical instructions to the procurement offices. The detailed instructions called for the procurement of a two, eight, and fifteen-place gliders and their associated equipment. Unfortunately, glider production was not to be easy as the production of powered aircraft and engines consumed the bulk of the US aircraft industry. Consequently, eleven different companies received glider contracts including some unlikely bidders such as furniture and coffin manufacturers.⁵ As the glider force began to get off the ground, military planners understood that this new concept of vertical envelopment required tactical doctrine. Similar to the British and the Germans, US military planners understood that glider doctrine could not evolve without integration with parachute forces.

Doctrine

Fortunately, the US Army was not building an airborne and glider force from scratch in 1941 as were the British. The curriculum of the Command and General Staff School at Fort Leavenworth began addressing problems of airborne warfare in 1938.⁶ From this early study, the US Army began developing an airborne, parachute force in

⁴ Raymond J. Snodgrass, "The AAF Glider Program November 1944-January 1947" (prepared by Historical Office, Intelligence Department, Air Material Command, Wright Field, November 1947), 2, as referenced in Janet R. Daly Bednarek, "American Combat Glider Program, 1941-1947: "Damned Fool Idea"," *Air Power History*, vol 43 no 4 (1996): 40.

⁵ Mrazek, *Glider War*, 53.

⁶ James A. Huston, *Out of the Blue: U.S. Army Airborne Operations in World War II* (West Lafayette, IN: Purdue University Studies, 1972), 48.

May 1939. Initially, American planners limited their conception of airborne warfare to an assumption that parachutists would operate in enemy rear areas primarily against key communication and supply installations. According to Field Manual 31-30, "Tactics and Technique of Airborne Troops," parachute troops were "the spearhead of a vertical envelopment of the advance and guard element of air landing troops or other forces."⁷ The concept of airborne warfare was one in which parachute troops seized suitable landing areas followed by glider or air-landed reinforcements. Subsequent doctrine emphasized the use of airborne forces en masse, not piecemeal, for no more than three days without support and advocated the benefits of glider insertion. Arriving via glider offered troops better armament and organization compared to parachuting.⁸ As airborne tactical employment doctrine became standardized, the organizational and command structures presented unique challenges.

Within months of the initial airborne exercises in 1939, questions arose as to who had ownership or control of the airborne forces. The US Army Air Corps provided the delivery vehicle for the soldiers, yet these soldiers fought as infantry once on the ground. After much discussion, the officers of the US War Department General Staff decided that parachute forces should be under Army control—the Air Corps simply provided the transportation.⁹ This organizational configuration continued with the absorption of glider forces in 1941. Army Air Corps pilots would fly the gliders to the objective but unlike the German and British doctrine, these pilots were not extensively trained in infantry tactics. Once on the ground, glider pilots were to land his glider safely, get his cargo or passengers out quickly, and secure his glider. Lacking suitable infantry training, glider pilots would fight only in exceptional

⁷ FM 31-30, May 1942, as quoted in Huston, *Out of the Blue*, 49.

⁸ Huston, *Out of the Blue*, 49-59.

⁹ Peter Harclerode, *Wings of War: Airborne Warfare 1918-1945* (London: Weidenfeld & Nicholson, 2005), 267.

circumstances with the intent of returning the pilots as soon as possible to friendly territory via ground or air transports.¹⁰ This organizational model proved to be contentious, as neither the pilot nor his cargo appeared satisfied with the arrangement—leading to frustration and resentment later in the war. Military planners, with command and control arrangements settled, turned their attention to the organization and application of airborne warfare.

US Army commanders and planners went to work building an airborne force consisting of parachute infantry, glider infantry, glider pilots, and associated air transports. By June 1942, the new airborne forces began to take shape and within a few months, the 82nd Airborne Division and the 101st Airborne Divisions were born. These divisions were initially allocated two glider and one parachute regiments each with accompanying support elements. Unfortunately, training and equipment shortfalls hampered the development of the airborne divisions. Early glider shortages forced a divisional reorganization where a parachute regiment replaced a glider regiment—shifting the allocation to two parachute regiments and one glider regiment per division.¹¹ The lack of glider aircraft was exacerbated by scarce tug aircraft, which affected training.

Like their British counterparts, US airborne forces lacked sufficient transportation aircraft to conduct training. 1st Troop Carrier Command (TCC), provided the transportation for all airborne and glider units. The workhorse of the TCC was the C-47 Skytrain (designated Dakota by the British), a variant of the civilian DC-3 airliner. The C-47, unlike the converted British bombers, had an exit door on its left side to facilitate the dropping of parachutists and had the power to tow two CG-4A gliders. The 1st TCC, initially allocated 600 C-47s and 2,000 gliders,

¹⁰ Alan Wood, *History of the World's Glider Forces* (Wellingborough, England: Patrick Stephens Ltd., 1990), 209; and Mrazek, *Glider War*, 134-135.

¹¹ Wood, *History of the World's Glider Forces*, 209.

possessed only fifty-six C-47s and a handful of gliders when it was established. Lieutenant General Lesley J. McNair, commanding general of Army Ground Forces, further compounded the training shortfalls when he stated that airborne troops needed only one flight in an aircraft or glider prior to commencing operations.¹² Even as the industrial production of transport and glider aircraft increased in 1943, airborne forces faced the harsh reality of testing their doctrine and machines in combat before they were completely ready. Consequently, the success or failure of glider operations was squarely on the shoulders of the glider pilots.

Pilots and Training

The availability of qualified glider pilots was a perpetual problem. In fact, the US only had 160 licensed civilian glider pilots of which only twenty-five were certified instructors.¹³ On December 20, 1941, just thirteen days after the bombing of Pearl Harbor, senior Air Corps leaders established the requirement for glider pilots at 1,000. This was not an arbitrary number, as military estimates assumed seventy-five percent of the men and equipment of a standard infantry division could be transported in gliders, with the remainder transported in the tow aircraft. Military planners soon realized that the increasing size of the glider pilot program would simultaneously interfere with the growing powered-pilot requirements. With the priority resting on the power-pilot program, planners decided that glider pilot training should be open to select enlisted men with prior flying experience. Unfortunately, even this resource could not meet the manpower needs and General Arnold further expanded the shortage when he increased the glider pilot requirement

¹² Clay Blair, *Ridgeway's Paratroopers: The American Airborne in World War II* (Garden City, NY: Doubleday & Company, 1985), 43; and Harclerode, *Wings of War*, 267.

¹³ John L. Lowden, *Silent Wings at War: Combat Gliders in World War II* (Washington: Smithsonian Institution Press, 1992), 38.

from 1,000 to 6,000 in April 1942.¹⁴ The tremendous demand for glider pilots placed considerable strain on the training regimes required for glider pilot qualification.

The glider pilot trainee faced many interesting obstacles in his quest for his wings. The military pilot training bases, already overburdened with the demands of power-pilot training, could not accommodate the influx of glider pilot trainees. Civilian airports and flight schools became the center of glider pilot training and the first graduate received his wings in June 1942 at Washington, D.C. airport.¹⁵ Constant change and flux were characteristics that defined American glider pilot training. Initially, entry standards required applicants to be a graduate of secondary pilot course, have held a private pilot certificate, or a glider pilot with at least thirty hours or two hundred flights. Once the demand for pilots increased, entry standards lowered and eighteen glider training schools sprang into existence across the US. After several iterations, a common standard for certification evolved. Glider pilots would receive six weeks of flying instruction; accomplish thirty hours flying in a single engine aircraft, eight hours in a two-place glider, and eight hours in a nine or fifteen-place glider. As noted earlier, American glider pilots did not receive any advanced infantry training and most entered combat with little or no knowledge of how to fire weapons or fight as an infantryman.¹⁶ Unfortunately, glider pilots had to overcome additional discrimination beyond just inadequate infantry training.

Upon completion of flight training, glider pilots received a pair of silver wings that were the same as the powered flight pilots except they had a letter 'G' in the center. Glider pilots, at least until November 1942, received the rank of staff sergeant upon graduation—not the coveted commissioned officer rank of their power-pilot contemporaries. Military

¹⁴ Charles J. Masters, *Glidersmen of Neptune: The American D-Day Glider Attack* (Carbondale, IL: Southern Illinois University Press), 23.

¹⁵ Wood, *History of the World's Glider Forces*, 208.

¹⁶ Mrazek, *Glider War*, 134-135.

leadership later corrected this inequity and after November 1942, glider pilots attained the rank of flight officer (warrant officer) at graduation and even had the opportunity later to become commissioned officers. Glider pilots, facing scorn from almost every angle, suffered from low morale. Traditional powered flight pilots believed the glider pilot inferior because of the low barriers to entry for glider training and the short time required for qualification. The maximum age for glider training was thirty-five compared to twenty-six for power pilots and minor physical disabilities, such as less-than-perfect eyesight, were not a problem.¹⁷ Infantrymen saw their untrained transporter as a liability on the battlefield. Even the extra pay for hazardous duty was inequitable. US glider pilots did not receive any extra pay until mid-1944, unlike the paratroops who received an extra fifty dollars a month from the very inception of their training.¹⁸ The sudden demand for a glider force, not only affected the operators, but also influenced the machines that brought them to battle.

Machines

The production demands of bomber/fighter aircraft, armor, jeeps, and landing craft heavily burdened American industry in World War II subordinating glider contracts and production.¹⁹ US military procurement experts were forced to rely on some non-typical companies to produce gliders. Although most of the gliders were of high quality, errors in workmanship and high production costs plagued the glider program. Americans, like their German opponents, experimented with different glider designs but quickly settled on a few, key models. The CG-4A was the primary workhorse of the American glider fleet in World War II, although the CG-13 and CG-15 also saw action. As mentioned in Chapter 3, the British Hadrian was a replica of the American CG-4A and

¹⁷ Lowden, *Silent Wings at War*, 10-11.

¹⁸ Wood, *History of the World's Glider Forces*, 208-209.

¹⁹ Masters, *Glidersmen of Neptune*, 17-19.

saw considerable action in British operations. Interestingly, although American glider designs varied greatly during World War II, the US never seriously pursued a large glider along the lines of the British Hamilcar or German Me-321 *Gigant*. American designers built gliders that remained wedded to its primary tug aircraft, the C-47 Skytrain. Even with the importance placed on the glider program by General Arnold, fraud, waste, and abuse still plagued the development and procurement of US gliders.

Since almost all of the experienced aviation companies were involved in the priority production of military powered aircraft, the glider program had to turn to many small, untested companies. Many of these companies existed solely to gain military contracts with no prior experience in aviation, large-scale production, or aerodynamics. Additionally, since a combat glider industry did not exist in the US at the time, procurement officials could not reject companies based on lack of experience. Another factor complicating the production of gliders was the lack of a finite requirement, which stemmed from an unclear airborne and glider doctrine. Fortunately, one company emerged as the predominant producer of gliders and set the program on a course for success. This company, Waco Company of Troy, Ohio, set the glider program in motion, allowing the US to field a respectable combat glider in sufficient amounts.²⁰

The production of two-seat training gliders was relatively easy as several manufacturers of light aircraft successfully transformed models of their light airplanes into gliders—simply by removing the engine. Unfortunately, there was no easy fix for the larger gliders. When the procurement officials from Air Material Command sent preliminary engineering requirements for gliders to eleven companies in March 1941,

²⁰ Janet R. Daly Bednarek, "American Combat Glider Program, 1941-1947: "Damned Fool Idea"," *Air Power History*, vol 43 no 4 (1996): 40; see also Davis and Fenwick, "Development of Gliders."

only four responded with proposals. Of the four that responded, only Waco Aircraft Company's 8- and 15-place gliders proved successful in testing. The 15-place glider, later named the CG-4, drew the most favor from military planners. The CG-4, large enough to carry a jeep and designed with an upward-swinging nose for on-load and offload, conformed to General Arnold's vision of a flying jeep. As the CG-4 began extended testing, production contracts were awarded to eleven companies for the mass production of America's first combat glider.²¹

Initially conceived as an economical method of transporting troops into battle, the CG-4 (as well as the entire US glider program) proved an expensive endeavor. Of the eleven companies awarded contracts to build the CG-4, only four had any experience in the production of aircraft. Some of the other seven did not even exist prior to the start of World War II and one company specialized in manufacturing wooden furniture—no surprise that this company, Ward Furniture Company, only delivered seven completed CG-4's at a cost of \$379,457 apiece.²² This price was a stark contrast to the desired unit cost of \$20,000. The glider program also suffered from lack of quality in construction. The Waco engineering plans sometimes lacked the definition detail that other firms needed. Additionally, in the rush to construct and field a glider force, the War Department did not demand standard tooling for production. The War Department directed companies to build their own production tools, which made interchangeability impossible and created a logistical nightmare for the troops in the field. By the end of the war, only the Ford Motor Company and Waco produced quality gliders in large

²¹ Daly Bednarek, "Damned Fool Idea," 44. Information derived from "The Glider Pilot Training Program 1941-1943" (Army Air Forces Historical Studies: No.1, September 1943) 21, 25-37, 30, 89-91.

²² *Development and Procurement of Gliders in the Army Air Forces, 1941-1944*, (S.l.: s.n., 1946). 4-5, 219. Additional information on the costs of glider procurement can be found in Irving Brinton Holley, Jr., *Buying Aircraft: Material Procurement for the Army Air Forces* (Washington: U.S. Government Printing Office, 1964).

quantities and under the \$20,000 unit cost.²³ Despite production and quality problems, American gliders became a foundation of the emerging airborne weapon.

Of the nearly 16,000 American transport and training gliders produced for World War II, 13,909 of these were CG-4As. In fact, there were more CG-4A's manufactured during the war than any other model of airplane except the B-24, P-47, and P-51. The CG-4A carried a large amount of cargo for its weight for it could carry over 4,000 pounds of cargo and had an empty weight of only 3,440 pounds. Its design featured a welded steel frame, wooden wings, and a fabric-covered surface. The CG-4A floor featured reinforced plywood that accommodated up to quarter-ton vehicles. The floor combined with a wide fuselage accommodated a jeep with three soldiers, thirteen combat troops, or one M3A1 75-mm howitzer and three gun crewmembers, although the seats were removed for vehicles and cannons. Glider pilots sat side-by-side with dual controls. The CG-4A could land on plywood skids or wheels and featured a deployable parachute for descent and braking control. Because American airborne doctrine assumed light infantry would fight up to three days without heavy armor, no large, tank-capable contender emerged to replace the CG-4A. Although the US never produced a heavy-lift glider in mass numbers, gliders larger than the CG-4A were built and fielded.²⁴

Due to the success of the Waco Company with the CG-4A, the Army Air Force requested Waco's expertise in producing a larger glider. The result was a glider that featured more cargo capability and greater towing speed than the CG-4A. The cargo capacity improved from four thousand to over ten thousand pounds and could carry a M2 105 howitzer plus crew, one and a half ton truck, or up to forty combat

²³ Daly Bednarek, "Damned Fool Idea," 42-47; see also Davis and Fenwick, "Development of Gliders."

²⁴ James E. Mrazek, *Fighting Gliders of World War II* (New York, NY: St. Martin's Press, 1977), 103-111.

troops. Additionally, the CG-13A's maximum towing speed increased thirty miles per hour over the CG-4A—the extra speed could take advantage of the increased speeds of the C-46 Commando and the C-54 Skymaster. Overall, 132 CG-13A's were built, of which eighty-seven (eighty-one to Europe and six to China-Burma-India theater) arrived in the combat theaters—many too late for combat operations.²⁵

Despite the successes of the CG-4A, military planners believed that it needed some major modifications. By October 1943, Waco incorporated improvements to the CG-4A and began producing the CG-15A. Similar in appearance and cargo capability to the CG-4A, the CG-15A featured a shorter wingspan, enhanced flight controls, higher towing speed, improved visibility and landing gear. Waco built 427 CG-15A's but only eighty-seven of the CG-15A's were shipped to Europe.²⁶ American planners and engineers continued to experiment with glider design throughout World War II with some interesting results. For example, the XCG-17 was a C-47 stripped of its engines and towed behind a B-17. The XCG-10 and its forty-two seats was the second-largest glider built by the United States. This glider, specifically designed for the invasion of Japan, fortunately did not enter service in WWII. The XCG-18A was the world's first all metal glider and like the XCG-20, both developed into a powered transport after the war.²⁷

Despite problems with cost overruns and quality control, the US demonstrated tremendous resolve and dedication to its glider program. US glider and airborne troops, eager for action, volunteered to test their doctrine, training, and machines against the Germans. Early action in North Africa and the Mediterranean proved a baptism by fire and that provided critical lessons for the large-scale airborne operations destined for northern Europe.

²⁵ Mrazek, *Fighting Gliders*, 99, 124-127.

²⁶ Mrazek, *Fighting Gliders*, 99, 124-127.

²⁷ Wood, *History of World's Glider Forces*, 280-282.

Operation Husky / Ladbroke

During March 1943, planning began for Operation Husky, the Allied invasion of Sicily. The invasion called for a seaborne invasion by the British 8th Army on beaches south of Syracuse on Sicily's east coast while the US 7th Army landed on beaches on Sicily's southern coast—effectively protecting the British 8th Army's left flank. While the American 7th Army did not plan on using gliders to seize key objectives, British planners had other ideas. The British airborne landing, Operation Ladbroke, included a glider objective at the Ponte Grande Bridge, which spanned a canal, one and a half miles southwest of Syracuse. Unfortunately, British glider pilots were to go to war in American CG-4A gliders due to a lack of British Horsa gliders. These British pilots received on average only five hours of rudimentary training in the American glider, of which, only one hour had been at night.²⁸ Fortunately, a handful of American glider pilots volunteered to fly the dangerous mission as copilots.²⁹ Despite the success of the invasion of Sicily, American airborne planners learned many valuable lessons. One notable lesson was the skill and accuracy of transport pilots. Since airborne units (glider or parachute) went to battle with less organic firepower, concentration and mass were critical to their success. Sicily demonstrated that airborne troop success on the ground was tied directly to the skill of the transport and glider pilots bringing them to battle. American military leaders reaffirmed that airborne units should not be widely dispersed but concentrated and recommended intensified training (including night) for its transport and glider pilots. This training

²⁸ Milton Dank, *The Glider Gang: An Eyewitness History of World War II Glider Combat* (Philadelphia, PA: J.B. Lippincott Company, 1977), 72-73.

²⁹ Sources differ on the exact number of American pilots who participated in Operation Ladbroke. Milton Dank's, *The Glider Gang*, says twenty-eight American pilots took part. Clay Blair's, *Ridgeway's Paratroopers: The American Airborne in World War II*, states that only nineteen pilots participated. In either case, a few American pilots volunteered to assist the British pilots—most of whom had very little experience in the CG-4A.

would prove invaluable as American military planners turned to its airborne and glider forces to open the way for a full-scale amphibious invasion of Europe.³⁰

Operations Chicago, Keokuk, Detroit, Elmira, Galveston, and Hackensack³¹

Preparations for the invasion of Europe spanned three years and American military planners conceded airborne and glider forces would be vital to its early success. The airborne and glider forces could play a major role in the outcome of the seaborne invasion. These forces would establish a foothold inland, mount a holding action, and delay German counterattacks against the beaches.³² In preparation for the invasion, the US military gave the 82nd and 101st Airborne Divisions (AD) the mission of establishing the inland foothold. These airborne forces were to arrive via parachute and glider with the intent of capturing key road intersections, seizing or destroying bridges, delaying German movement to the landing beachheads. The airborne plan, Operation Neptune, scheduled for the pre-dawn hours of 6 June 1944 (D-Day), called for six glider missions and accompanying parachute drops. Parachute troops, landing before the gliders, were to mark the landing zones for both divisions. These landing zones (LZ West and LZ East) were approximately six miles inland from Utah Beach and two miles south of St. Mere Eglise. The gliders would land reinforcements, heavy guns, and equipment unsuitable for airdrop. The 82nd AD arrived in four waves beginning with Operation Detroit in the pre-dawn darkness on D-Day followed by Operation Elmira at sunset of the same day. Two later glider operations, Operation Galveston and Hackensack, were to follow the next day. The 101st AD arrived in two waves including Operation Chicago,

³⁰ Blair, *Ridgeway's Paratroopers*, 107.

³¹ For more information on American airborne and gliders in Europe in World War II see John C. Warren, "United States Air Force Historical Study: No. 97, Airborne Operations in World War II, European Theater," 1 January 1942 – 1 January 1945, IRIS No.467682, Air Force Historical Research Agency.

³² Masters, *Glider Men of Neptune*, 38.

which landed nearly simultaneously with Detroit, and Operation Keokuk scheduled for pre-sunset on D-Day.³³ With the scheme of maneuver set, the US finally had an opportunity to demonstrate the glider's effectiveness.

Despite problems with drop zone markings, Operation Chicago was a success as the first glider-borne elements of the 101st AD landed in France. The darkness, which hampered drop zone recognition, also affected the German defenders, as no gliders were lost to enemy fire. Although the darkness degraded the German defenses, it caused difficulties upon landing, as several gliders were unable to avoid the massive hedgerows that ringed the landing zones. The thick hedgerow, often over five feet high and three feet wide, took its toll on the CG-4A. One notable fatality was General Donald Pratt, Assistant Division Commander of the 101st AD. General Pratt, one of only two American airborne generals to land in combat in a glider, was sitting in the copilots' seat of the first glider, when upon landing he suffered a fatal skull fracture. The brakes on Pratt's glider were unable to stop the aircraft before it slammed into the infamous hedgerow. The impact with the hedgerow ejected the pilot and crumpled the glider. General Pratt's copilot seat, reinforced with extra armor for added protection, buckled when the glider crashed into hedgerow causing Pratt's head to strike the steel tube framework overhead.

Including General Pratt's death, only four troops died in crashes in Operation Chicago. Airborne troops particularly welcomed the gliders as they brought in critically needed artillery, anti-tank guns, and reinforcements. Additional elements of the 101st arrived later that day in Operation Keokuk. This glider operation was America's first tactical daylight glider operation. Although enemy fire and accidents claimed fourteen troops, Keokuk proved that gliders could land in daytime

³³ Mrazek, *Glider War*, 136.

without excessive losses. Despite a few problems, the 101st AD's glider operations achieved their objectives on D-Day.³⁴ The 82nd AD would not be so lucky.

Operation Detroit, which followed Chicago by ten minutes, did not have as easy a time getting to the landing zone. Turbulent weather, enemy anti-aircraft fire, and lack of landing zone markings all contributed to higher casualties. Most gliders missed the designated landing zone, some landing in swamps or fields filled with wooden obstacles. These obstacles, called Rommel's asparagus, were three to four foot wooden poles set in the ground to disrupt glider and airborne landings. The rough landings and obstacles disabled eleven of the twenty-two jeeps flown in but remarkably, crashes caused only three deaths. Operation Elmira, just as Keokuk, was a planned daylight operation to reinforce the 82nd. The gliders were to land on a large field and the clear weather combined with daylight made the descent seem easy. Unfortunately, the earlier elements of the 82nd AD were not able to access the status of the landing zone before the descent. Unexpected German resistance delayed the 82nd AD's movement to the landing area. General Ridgeway, commander of the 82nd, worried about the safety of the planning landing zone, tried in vain to contact the transport and glider aircraft before the gliders detached from their tugs. Fortunately, the ground party's ground signals prevented all but two gliders from landing in the contested field. Most of the glider pilots, seeing the objective area full of Germans, visually maneuvered their gliders to friendly positions and simply crash-landed.

Finally, Operations Galveston and Hackensack brought the last elements of the 82nd to France. Learning from the disasters of Elmira, the landing zone shifted to LZ East (where the 101st had landed). The LZ was out of range of enemy fire and safely in American hands. These later

³⁴ Mrazek, *Glider War*, 138-147.

operations went smoother than Elmira although many gliders were unrecoverable after landing. The glider operations of D-Day had shown one thing—the CG-4A survived landings better than the British Horsa. The all-wood construction of the Horsa did not absorb the harsh landings as well as the steel-tubed CG-4A. In the end, Operation Neptune proved that gliders could do their part in an airborne operation. Gliders carried ninety-five howitzers, 290 vehicles, 238 tons of cargo, and 4,021 men to France.³⁵ America's first large-scale airborne operation proved a success but even bigger operations to come would test the limits of airborne and glider operations.

Operation Market-Garden

As the Allied forces continued the assault through France, military planners envisioned a final offensive through Holland that would cross the Rhine, isolate and occupy the Ruhr, and possibly end the war. The ambitious plan, proposed by British General Bernard Montgomery, called for extensive use of airborne and glider forces to spearhead the attack. Operation Market-Garden would be the first major daylight airborne assault since Germany's attack on Crete more than three years before. The entire operation would lay a carpet of airborne and glider troops over the fifty-five miles from Arnhem to Eindhoven. Operation Market-Garden was a massive airborne endeavor, even when compared to Normandy. In the Normandy invasion, airborne and glider troops flew one hundred miles across the Channel to objectives only six to ten miles inland. Market-Garden required nearly 35,000 troops—almost twice the number employed at Normandy—to move over three hundred miles and land sixty-four miles behind German front lines. Lieutenant General Lewis Hyde Brereton, commander of the 1st Allied Airborne Army, directed a daylight assault. General Brereton knew that daylight would alleviate some of the confusion that plagued Sicily and Normandy, while providing

³⁵ Mrazek, *Glider War*, 148-161.

higher accuracy of landings. Additionally, Brereton assumed the *Luftwaffe* was too weak to offer effective resistance and Allied bombers could neutralize German flak batteries. Unfortunately, Allies did not have enough tug and glider aircraft to deliver all of the three and one-half airborne divisions slated for the operation. This meant that the entire airborne force arrived over a period of several days, which afforded only the first wave the element of surprise.³⁶

The final plan for Operation Market-Garden called for three waves over three days of glider and airborne troops. The 82nd AD was to take and hold six bridges near Nijmegen while the 101st AD was to take and hold six bridges near Eindhoven. Operation Market-Garden became the largest airborne operation of World War II, and gliders were a critical part. Over the period of 17-30 September 1944, glider operations continued almost daily. In total, the US landed 10,374 men on 1,618 gliders. Additionally, gliders carried 1,431 tons of cargo.³⁷ Despite stronger than expected resistance, American airborne units were able to seize their key objectives within days. One unexpected problem that arose was what to do with US glider pilots after landing. Commanders did not have a plan for the more than 1,700 glider pilots made the one-way trip to Holland. These glider pilots, eager to help, did not have adequate infantry training and were often a detriment. General James Gavin, commander of the 82nd expressed his frustration with glider pilots, "...One thing in most urgent need for correction is the method of handling our glider pilots. I do not believe there is anyone in the combat area more eager and anxious to do the correct thing and yet so completely, individually and collectively, incapable of doing it than our glider pilots."³⁸ Despite the problems with glider pilots on the ground, General Matthew Ridgeway, commander of XVIII Corps (Airborne), did

³⁶ Gerard M. Devlin, *Silent Wings: The Saga of the U.S. Army and Marine Combat Glider Pilots During World War II* (New York: St. Martin's Press, 1985), 228-237.

³⁷ Mrazek, *Glider War*, 223.

³⁸ Mrazek, *Glider War*, 219.

not change the organization of the glider pilots. Unlike their British counterparts, American glider pilots did not transfer to US Army division commanders. They remained in troop carrier squadrons, assigned to the Army Air Forces.³⁹ American glider pilots, eager to prove their mettle in combat, would later have their chance at Bastogne—where gliders and their brave pilots brought relief to the beleaguered defenders.

Bastogne

When the German counter-offensive broke through the Ardennes in mid-December 1944, the US had just two divisions in reserve—the 82nd and 101st. Although these divisions were recuperating from Operation Market-Garden, General Eisenhower reluctantly threw them into battle, with the 101st moving to Bastogne. Within days of arriving at Bastogne, German panzer units encircled the city and overran the 101st's field hospital. Desperate for medical supplies and ammunition, General Anthony McAuliffe requested immediate air resupply. Poor weather and a shortage of parachutes for drop bundles prevented planes loaded with supplies from departing England. Mounting casualties and dwindling ammunition stores elevated McAuliffe's already anxious position. American planners, determined to aid the 101st, loaded eleven gliders with surgeons, litters, and medicine and headed for Bastogne. These gliders were in France and did not have the same weather problems facing the transports in England. Fortunately, all eleven gliders landed before German forces detected them. The following day fifty more gliders departed for Bastogne—thirty-five of which landed close enough to aid the defenders. In the end, gliders delivered 106,291 pounds of cargo and the medical personnel brought in saved numerous lives during those tenuous days.⁴⁰ The gliders and their brave pilots again proved their worth in battle.

³⁹ Mrazek, *Glider War*, 220.

⁴⁰ Mrazek, *Glider War*, 224-229.

Operation Varsity—Rhine Crossing

Early in 1945, the Allies agreed on a campaign to end the war against Germany. The plan included several airborne assaults on enemy positions across the Rhine River. Unlike past operations in which the airborne forces led the first assaults, Operation Varsity featured a conventional, waterborne attack that preceded the airborne and glider movement. The airborne and glider forces were to drop in the midst of the advancing ground army, some six hours after the operation began. Additionally, unlike Operation Market-Garden, the airborne assault over the Rhine would land troops in concentrated masses near their objectives—landing the entire airborne force within three to four hours nearly six miles behind the German lines. The strategy of the attack put the Germans in a quandary—for they could not simultaneously oppose the river crossing and the airborne assault.⁴¹ Noting the improved accuracy of glider and airborne landings in Operation Market-Garden, Operation Varsity was to be a daylight maneuver.

Despite some localized German resistance, Operation Varsity was a success. Forced to make a tough decision, German commanders chose to oppose the airborne assault, allowing the British and American ground elements to cross the Rhine without much of a fight. On 24 March 1945, elements of the 17th Airborne Division began landing in the mid-morning and had met their objectives by dusk. In total, the US used 798 gliders and 570 tug aircraft to cross the Rhine. Unlike operations in Holland, where the glider pilots were a nuisance to the ground commanders, Varsity had a plan for the glider aircrew. After landing, the pilots assembled at pre-designated areas, immediately reported to the command posts, and evacuated as soon as practical. Even though

⁴¹ Lawrence Wright, *The Wooden Sword* (London: Elek Books Ltd., 1967), 241-242.

American glider pilots lacked sufficient ground combat skills, their supreme flying skills made the last major airborne operation a success.⁴²

Conclusions

Despite an early lack of interest, the American glider program and its pilots emerged as a true success of World War II. Uncertain of the glider's role in combat, US military planners eventually settled on using the glider to augment airborne forces. The American glider forces, at least in the European theater, brought reinforcements to exploit and solidify tenuous paratroop gains. Even in this support role, gliders proved invaluable by delivering extra troops, heavy weapons, vehicles, and ammunition. The doctrine of resupply and reinforcement held consistent throughout the war as the US, unlike Germany and Britain, never used the glider in a designated commando role. Since the US did not expect the glider to be used in a commando role, the glider pilots were never adequately trained for ground combat. This meant that glider pilots, deficient of ground combat training, remained outcasts—disrespected by power pilots and unwanted by ground troops. However, this impression, at least among the ground troops, changed after the brave efforts of the glider pilots at Bastogne. At Bastogne, glider pilots went where no powered-pilot could—right into the heart of the battle. Finally, the US remained committed to the glider throughout the war. This dedication resulted in the tremendous success of Operation Varsity, which signaled the final thrust into Germany and the eventual end of the war in Europe. Yet even in success, the US glider pilots still felt they never achieved the recognition they deserved. The following humorous song, sung by the glider pilots, summarizes their plight:

Oh, once I was happy, but now I'm Airborne
Riding in gliders all tattered and torn,
The pilots are daring, all caution they scorn,
And the pay is exactly the same.

⁴² Wood, *History of the Glider Forces*, 259-267.

We glide through the air in our flying caboose,
Its actions are graceful just like a fat goose,
We hike on the pavement till our joints come loose,
And the pay is exactly the same.

Once I was infantry, now I'm a dope,
Riding in gliders attached to a rope,
Safety in landing is only a hope,
And the pay is exactly the same.⁴³

⁴³ Gerard M. Devlin, *Paratrooper!: The Saga of the U.S. Army and Marine Parachute and Glider Combat Troops During World War II* (New York: St. Martin's Press, 1979), 661-662. The song was sung to the tune of "The Daring Young Man on the Flying Trapeze."

Chapter 5

Gliders in China-Burma-India

General Wingate had told me in Burma that without the gliders and the skill and courage of their pilots he could not have carried on that operation. From our experiences we learned a lot lessons, which I took to England for use in the invasion of France.

*Major William H. Taylor
Commander, Glider Pilots (China-Burma-India Theater)*

Background

Although a few American glider pilots experienced combat in Operation Ladbroke at Sicily, the first major test of US glider training, doctrine, and aircraft happened in the China-Burma-India (CBI) Theater. The operations in CBI, conducted much differently from those in Europe, proved a success. The unique environment of Southeast Asia forced US military planners to adapt training, doctrine, and aircraft. Ironically, it was the vision and influence of a British officer and two American fighter pilots that led to the success. Fortunately for the US, time allowed the critical lessons learned from CBI to transfer to Europe. These lessons meant that unlike the British, American glider forces never experienced the losses associated Operations Freshman and Ladbroke.

The war efforts in CBI began rather poorly as the Japanese stormed through Southeast Asia in 1942. By March 1942, Rangoon, the chief port and capital of Burma, fell to the Japanese. After capturing Rangoon, Japanese forces pushed northward in an attempt to cut the Allied supply lines from India to China. British forces, fearing complete disaster, withdrew from Burma into bases in India. The retreat into India closed the only land resupply route into China from India—forcing US cargo aircraft to make the perilous journey over the Himalayas to

keep forces supplied in China.¹ Allied forces, under the command of British General Charles Orde Wingate, were not able to counterattack until February 1943. Wingate, a veteran of unconventional warfare in Palestine and Ethiopia, led the incursion into Japanese territory with mixed brigades of British, Indian, and Burmese forces.² Relying on air resupply during long-range penetration missions, Wingate returned to India six weeks later having lost nearly one-third of his men.³ Although air resupply enabled Wingate to harass the Japanese, his forces lacked an extraction method meaning many wounded soldiers were left behind in the jungles—a serious blow to morale. However, an opportune meeting in August 1943 would change Wingate’s circumstances in CBI.

In August 1943, President Roosevelt, Prime Minister Churchill and their Combined Chiefs of Staff met in Quebec, Canada to discuss operations in CBI. Wingate lectured the assembly on the tactics used in Burma and convinced them that his methods could be used on a larger scale to reopen the land route to China. As a result of the meeting, the US agreed to provide Wingate an air component capable of resupply, infiltration, evacuation, and fire support. General Hap Arnold, only ten days removed from a glider demonstration in North Carolina, considered the glider a perfect aircraft for Wingate’s needs and sought to quickly deploy an air component. Arnold gave the program considerable merit by assigning Colonel Philip C. Cochran, a fighter pilot who had fought the *Luftwaffe* in North Africa, as its commander. Arnold gave Cochran, along with his deputy, Colonel John R. Alison (himself a fighter ace with seven Japanese kills), the authority to obtain any aircraft and personnel they

¹ John L. Lowden, *Silent Wings at War: Combat Gliders in World War II* (Washington: Smithsonian Institution Press, 1992), 63.

² John R. Galvin, *Air Assault: The Development of Airmobile Warfare* (New York: Hawthorn Books, 1969), 132.

³ Alan Wood, *History of the World’s Glider Forces* (Wellingborough, England: Patrick Stephens Ltd., 1990), 241. Wingate set out with 3,000 men and returned with only 2,182.

needed to do the mission. Among the varied list of aircraft, Cochran acquired one hundred CG-4A combat gliders and pilots.⁴

Wingate's Vision

By February 1944 and with his new forces in theater, Wingate received orders to interdict the flow of supplies heading to Japanese units that were opposing General Joseph W. Stillwell's First Chinese Army and to "inflict the maximum confusion, damage, and loss on the enemy forces in Burma."⁵ Wingate, weary of his experiences in 1943, saw glider-borne forces and their equipment as a means of rapidly inserting ground troops, clearing jungle strips for larger transports, and evacuating wounded. However, the evacuation requirement necessitated a way to extract gliders from landing zones. Fortunately, US glider pilots had developed such a technique for this tricky operation.

Although many gliders made only a one-way trip to their objective area, military planners hoped to reuse gliders for multiple missions. With this mindset, engineers developed a glider recovery technique termed "the snatch." The snatch pickup, although simple in design, was nonetheless dangerous. The tug aircraft, normally a C-47 or C-54, extended a steel cable with a hook on the end to catch the glider's towline. The glider ground station had two poles with the towline looped tightly between them. The tug aircraft flew slow and low enough to allow its hook to grab the elevated towline. As the tug continued forward, the slack in the towline tightened snapping the glider in the air with 0.7 G-force in six seconds. Throughout World War II, the US executed 485 glider snatches with fifty-nine in CBI.⁶ Even in daylight, the maneuver

⁴ Gerard M. Devlin, *Silent Wings: The Saga of the U.S. Army and Marine Combat Glider Pilots During World War II* (New York: St. Martin's Press, 1985), 135-138. The 1st Air Commando Group consisted of 12 B-25H bombers, 30 P-51A fighters, 13 C-47, 12 C-54, 100 L-1 and L-5, 100 CG-4A, 75 TG-5 (two-seat trainer gliders), and 6 YR-4 helicopters.

⁵ Peter Harclerode, *Wings of War: Airborne Warfare 1918-1945* (London: Weidenfeld & Nicholson, 2005), 587-588.

⁶ Keith H. Thoms, Gerald Berry, and Lee Jett, "Austere Recovery of Cargo Gliders," *Joint Forces Quarterly* 48, no. 1, (2008), 135-136.

was dangerous, but at night, it was nearly suicidal as the only markings were small lights on top of the ground station poles. Based on the inherent dangers of working behind enemy lines with unfamiliar doctrine, the operation required some of America's best glider pilots.

Pilots and Training

Colonel Cochran picked Major William H. Taylor, a glider pilot who had conducted experimental jungle landings with CG-4A in Panama, to be the commander of his glider detachment. Cochran, understanding the dangers and uniqueness of the mission, sent Taylor to the advanced glider school to interview personally the pilots who had volunteered for the then secret mission. Taylor prioritized the applicants—giving high weight to experience and those pilots who had graduated from the glider mechanic school. During the interviews, Taylor told each of the volunteers that they would return home from this secret mission as either a dead glider pilot or live hero. Taylor selected one hundred glider pilots, including Flight Officer John L. 'Jackie' Coogan. Coogan, a former Hollywood child star and ex-husband of Betty Grable, would later star as Uncle Fester in the Adams Family television show. An accomplished pilot, Coogan would later lead a glider formation in Operation Thursday—the glider-borne insertion to reopen a land route from India to China. After completing training, the volunteer pilots moved to Seymour Johnson Field for advanced training. Unlike their counterparts in Europe, these glider pilots would not be a liability on the ground in combat.⁷

Still uncertain of their destination, glider pilots entered a grueling six-week training program at Seymour Johnson. After receiving US Army paratroop uniforms and US Marine Corps jungle boots, the pilots received commando training—complete with hand-to-hand combat, twenty-five mile marches in full gear, and weapon qualifications.

⁷ Devlin, *Silent Wings*, 138-139.

Additionally, training emphasized night operations including formation flying, landing, and snatches. With visions of Doolittle's Raid still fresh combined with the heavy emphasis on night operations, many pilots believed they were destined for an objective in Japan.⁸ Complete with training, the volunteer glider pilots shipped out—still uncertain of their destination.

Machines

The only glider used in CBI was the CG-4A. Although the CG-4A carried less cargo and personnel compared to the British Horsa, it was better suited for jungle operations. The landing zones used in CBI were small and the Horsa was longer, wider, and heavier than the CG-4A. The primary tug aircraft, the C-47 could tow two fully loaded CG-4As (7,500 pounds each) and while only towing one fully weighted Horsa (15,750 pounds).⁹ Additionally, military planners thought the wet climate and rough landing zones would spell doom for the Horsa's mostly wooden frame, compared to the steel-tubing frame on the CG-4A. The CG-4A with its hinged nose offered a quicker loading and unloading procedure compared to the Horsa. Although the CG-4A was the glider of choice, the harsh environment and unique mission set required some modifications to the machine.

Wingate's forces conducted long expeditions behind enemy lines and had to be prepared to go several days between resupply missions. Burma's harsh environment with its razor-sharp grass, dense jungle, and muddy trails made mobility very difficult on the individual fighter. To help alleviate some of the burden, Cochran and his men modified gliders to bring mules into the forward areas. These mules, with their larynx surgically removed to prevent unwanted neighing while on missions in the jungle, helped remove heavy logs from landing zones and could carry

⁸ Devlin, *Silent Wings*, 138.

⁹ James E. Mrazek, *Fighting Gliders of World War II* (New York, NY: St. Martin's Press, 1977), 75, 111.

extra supplies into the jungle. The glider crews reinforced the CG-4A floor and built three individual stalls for the mules in the cargo compartment. Surprisingly, the mules were good passengers (although an armed handler flew with the mules to administer a lethal shot if a spooked mule began destroying the glider in flight).¹⁰ By early 1944, glider pilots and their modified aircraft stood ready to prove their skill and determination.

Operation Thursday

With his forces in place, Wingate received orders to begin operations against the Japanese in Burma. These operations centered on the cutting of supply and communication lines, while sowing disorder and confusion in the Japanese forces. To accomplish this mission, Wingate formulated a complex but methodical plan. Part one of Wingate's plan called for the 16th Brigade to make a strenuous 455-mile foot march into Burma, relying on the 1st Commando Group for aerial resupply. Four weeks later, part two of the plan would move the 77th and 111th Brigades via glider into areas near the 16th Brigade. Finally, after another four weeks, the 14th Brigade would air land via C-47 to reinforce the areas secured by the earlier forces. The glider operation, codenamed Operation Thursday, scheduled for the first full moon after the monsoon season, began on a Sunday—March 5, 1944.¹¹

The concept of Operation Thursday required eighty gliders to land at two separate landing zones at night in small clearings in the middle of the jungle. Wingate chose these landing locations because of their remoteness, which meant that only light infantry could offer resistance—not heavy guns. To preserve the complete secrecy of the move, General Wingate issued orders that no airplanes were to fly anywhere near the areas until the glider landings were completed. Fortunately, for the glider pilots and their cargo, Colonel Cochran disobeyed this order.

¹⁰ James E. Mrazek, *The Glider War* (New York, NY: St. Martin's Press, 1975), 112-114.

¹¹ Devlin, *Silent Wings*, 144-146.

Fearing the Japanese had moved obstacles onto the landing zones, Cochran ordered a B-25, equipped with aerial cameras, to photograph the landing zones. The bomber, based on its high altitude did not compromise the landing sites, but did produce evidence that one of landing zones was full of teakwood logs. Cochran's initiative saved countless lives but the plan now involved all gliders on one landing zone.¹²

A shortage of pilots complicated the planning. Never expecting a large-scale glider operation, Cochran and Taylor only recruited and trained one hundred glider pilots. With eighty gliders committed to the mission, there were not enough pilots available for each aircraft to have a qualified copilot. Therefore, each glider flew and landed with only one pilot at the controls—not a problem unless enemy ground fire injured the pilot inbound to the landing zone. A second problem involved the weight of the glider. Major Taylor, commander of the glider troops, had authorized a gross weight overage on the glider. Unfortunately, the logistics planners did not account for the excess ammunition that each infantryman would secretly bring aboard the glider. The gliders, already loaded beyond established safety limits, were dangerously overweight. It did not take long for this oversight to affect the mission.¹³ Finally, the cycle of hot sun and drenching rains insidiously weakened the nylon towropes. Heavy gliders with one pilot and weak towropes spelled problems for the glider assault force.

Within thirty minutes of the glider armada launching, several gliders signaled distress near the India-Burma border. The towlines pulling the overweight gliders had snapped. Despite the trouble, Taylor and Allison's gliders made it to the landing zone. After landing, Taylor and Allison realized that the tall grass had hidden the deep ruts and furrows on the landing zone. Powerless to stop the oncoming flow of

¹² Devlin, *Silent Wings*, 147.

¹³ Devlin, *Silent Wings*, 148.

aircraft, many gliders sustained heavy damage both from the terrain and from crashing into each other. Fortunately, the code word to stop further dispatches of gliders was relayed to India but not before there was significant damage to the landing forces. Although the damage was severe, as only three gliders were snatched and used again, the force that survived the landing was still able to establish a dirt runway less than a day later.¹⁴ The runway allowed additional troops, supplies, and ammunition to arrive via C-47. Despite the damages, the Operation Thursday was a success—in six days 9,052 troops, 175 ponies, 1,183 mules and 509,082 pounds of supplies had been flown over 150 miles into Japanese-held ground.¹⁵ Gliders continued to support the operation with additional night landings until the end of August 1944, when Operation Thursday ended. The unorthodox force tied down Japanese forces while cutting some lines of communication. The glider proved invaluable throughout the operation by bringing in troops, supplies, and even bulldozers, while evacuating wounded from isolated regions. Additionally, glider pilots performed admirably with their infantry partners—many pilots spending weeks in the jungle before evacuating back to India. Tragically, Wingate did not survive to see the success of his unconventional force as he died in a B-25 crash on 24 March 1944.¹⁶ Despite Wingate's death, the mission continued in CBI until the final Japanese surrender in August 1945.

Conclusions

Operations in CBI proved that gliders with skilled pilots, given the proper training and equipment, were important military assets. Yet, it took tremendous leadership and vision from a few key personalities to achieve success. General Wingate, with his unconventional approach, provided a framework for ingenuity and innovation. General Arnold

¹⁴ Devlin, *Silent Wings*, 152-153.

¹⁵ Wood, *History of the World's Glider Forces*, 243.

¹⁶ Harclerode, *Wings of War*, 595.

allowed Colonels Cochran and Allison to assemble an untraditional team of airmen to accomplish the mission. Major Taylor and his glider pilots demonstrated personal bravery by landing hundreds of miles behind enemy lines at night and fighting along side the soldiers. Despite pilot shortages and equipment difficulties, Operation Thursday became a model of how to wage effective three-dimensional warfare deep behind enemy lines.¹⁷ Furthermore, the success of Operation Thursday prompted General Arnold to dispatch Colonel Allison to Europe to assist in planning for what was to become Operation Neptune—a glider borne assault into Normandy. After Burma, there could be no doubt that the glider had earned its stature as a weapon of war.¹⁸

¹⁷ Devlin, *Silent Wings*, 162.

¹⁸ Mrazek, *Glider War*, 128.

Chapter 6

Where Did the Gliders Go?

Undoubtedly, the tagging of gliders as 'gliders' did much harm to their cause in the United States. Despite efforts to divorce the glider from the widely held belief that it was just an overgrown sailplane the connotation was there, and it led to serious confusion and doubt relative to the level of performance and merit of this new weapon in the power-oriented Air Force. Better for the whole program, had the glider been referred to as a motorless transport.

*James E. Mrazek
The Glider War*

Introduction

Despite the success of their glider programs, all three nations decided to abandon them soon after World War II. Germany, a country destroyed and occupied at the end of WWII, had no choice but to terminate their airborne and glider programs at the direction of their conquerors. However, the elimination of German airborne forces was almost *fait accompli* as it had already fallen out of favor with Hitler after the costly victory at Crete. Crete was Germany's last major airborne and glider operation of the war. The UK gradually phased their gliders out of service after the end of WWII. By 1950, the UK reduced their Glider Pilot Regiment to a single squadron and discontinued training of new glider pilots. Within the next year, the Royal Air Force terminated its glider program and reassigned its pilots to powered aircraft.¹ Even the UK's involvement in Malaya, similar to the CBI Theater in terrain and operating environments, was not enough to save the glider program as drastic cuts in defense budgets sealed their fate. Even the US, the undisputed victor of WWII, eliminated its glider program. What

¹ Gerard M. Devlin, *Silent Wings: The Saga of the U.S. Army and Marine Combat Glider Pilots During World War II* (New York: St. Martin's Press, 1985), 374.

considerations caused the US to eliminate a very useful capability even when no similar capability existed? In order to answer these questions first posed in Chapter 1, a careful examination of post-war military organizations and technological improvements is required.

Rapid Drawdown

As victory in World War II approached, the United States and its military began planning for a rapid drawdown of forces. A war-weary American public, anxious to return to normalcy after nearly five years of sacrifice, hastened to dismantle the mightiest military forces the world had ever seen. The effects of the military drawdown were immediate and the pervasive reductions affected both glider pilots and airborne forces. Only four months after V-J Day, the Army Force (AAF), which provided glider pilots, shrank from a wartime peak of over 2,300,000 men to fewer than 889,000, and by the end of 1946 the AAF had only 341,421 men.² Airborne forces faced similar reductions as the glider fleets were dramatically reduced in size, to the point that there were only enough gliders left in 1946 to lift a single regiment of the 82nd Airborne Division. Additionally, only one glider infantry unit, the 325th, remained on active duty after the war.³ The decreased demand for gliders and their pilots led to some interesting post-WWII results.

The US declared all gliders, except the CG-15 (the replacement for the CG-4A), war surplus items. As early as November 1945, the US government started selling crated CG-4A gliders for as little as seventy-five dollars. This amount seems unfathomable as the average cost to build the CG-4A came closer to \$26,000 but the government was keen to liquidate the unwanted war material.⁴ Buyers scooped up the surplus gliders and their associated packing grates, not for their interest in

² Warren A. Trest, *Air Force Roles and Missions: A History* (Washington: U.S. Government Printing Office, 1998), 109.

³ Devlin, *Silent Wings*, 372.

⁴ Irving Brinton Holley, Jr., *Buying Aircraft: Material Procurement for the Army Air Forces* (Washington: U.S. Government Printing Office, 1964), 373.

motor-less flying, but because of its precious lumber. The shipping crates alone contained over 10,000 board feet of Grade A lumber, which was enough to build a small, modern house. In fact, the gliders sold with such haste that AAF officials neglected to keep enough for display in its aviation museums.⁵ Glider pilots faced similar challenges after World War II as many went looking for an occupation.

Many of the discharged glider pilots had hopes of getting a job with the commercial airlines. Unfortunately, glider pilots did not compete well with the powered-flight contemporaries and many sought employment elsewhere. One business, founded by a cargo pilot from World War II, made a serious attempt to use gliders for commercial profit. The firm, the Wing Cargo Company of Philadelphia, utilized two surplus gliders in 1946 to pick up strawberries in Georgia and oranges in Florida and deliver them to wholesalers in Philadelphia. Unfortunately, stiff competition from trucking and railroad companies forced the business to close after three months.⁶ Life for the glider pilots still on active duty was just as frustrating.

The majority of the few hundred glider pilots who remained on active duty after WWII received assignment to Pope Air Force Base, North Carolina, for duty with the 82nd AD. Other pilots were stationed to Fort Benning, Georgia, where student paratroopers at the U.S. Army Parachute School were required to take glider orientation flights as part of their airborne training until 1949. Still other pilots were assigned to Wright Field, Ohio, where they flew experimental models of aluminum-skinned gliders under development. Ironically, the glider test pilots at Wright Field literally worked themselves out of a job by helping to perfect two new gliders—the XCG-18A and XCG-20—both became powered transport aircraft. By late 1947, the XCG-18A with two engines added became the C-122 and by 1949, the XCG-20 became the versatile C-123.

⁵ Devlin, *Silent Wings*, 372.

⁶ Devlin, *Silent Wings*, 373.

Additionally, some glider pilots became power pilots with many serving with distinction in Korea and Vietnam.⁷ The rapid demobilization of US forces after WWII had dramatic effects on the numbers of glider fleets, pilots, and troops. The end of WWII also predicated careful examination of the airborne doctrine from the preceding war, which had grave consequences for the glider force.

The Decline of the Glider

As World War II ended, the government began a critical evaluation of its military capabilities. The glider and its larger component, airborne forces, inevitably became the focus of after-action reports. By 1946, the future of airborne forces seemed dim. Heavy casualties to gliders and low-flying transport aircraft in Operation Market-Garden and Operation Varsity indicated a high risk from automatic weapons and anti-aircraft weapons.⁸ Although the gliders performed admirably in many operations, airborne officers were disappointed in their overall contributions. One study, conducted by Army ground and airborne forces, concluded gliders should be used only for the transportation of cargo. This was a marked change from the earlier concept that gliders should deliver the greater portion of an airborne division into battle. According to the study, several factors caused the shift in the concept of glider operations. The most notable factor was the vulnerability of the glider to anti-aircraft and ground fire. The glider's susceptibility to fire caused a higher percentage of casualties to glider troops than to parachute troops before and immediately after landing. Another factor detrimental to gliders was the need for open fields for landing and the amount of airspace taken up by glider formations. Finally, the study illustrated the high financial cost of glider operations. Most gliders

⁷ Devlin, *Silent Wings*, 373-374.

⁸ Michael Hickey, *Out of the Sky: A History of Airborne Warfare* (New York: Charles Scribner's Sons, 1979), 183.

sustained damage upon landing making recovery for subsequent use almost impossible.⁹

Some of the criticism seemed devoid of context and basic airborne doctrine. For example, the glider troops suffered heavier casualties than paratroops may have been the doctrinal principle that paratroops should always precede glider troops by enough time to clear landing zones for the gliders. In fact, instead of making the glider landings easier, the parachute drops likely alerted the defenders in time to be effective against the gliders. In an airborne operation, the safest place is often in the lead elements where the benefits of surprise are greatest. American doctrine, at least in the European theater, meant that the gliders would always follow paratroop drops—making them more vulnerable to an alerted defense.¹⁰ Another problem that arose in the post war studies was the role of the glider pilot after landing. This question received special attention from airborne commanders and was never solved with any satisfaction. The airborne concept had proved its worth in combat but nobody wanted the responsibility of training glider pilots as infantrymen. Despite the criticisms, gliders managed to maintain a role in airborne doctrine in years after World War II. This role, however, was short-lived.

In April 1949, the US Army conducted Operation Tarheel, the last American training maneuver that employed gliders. Tarheel was a sizable month-long exercise that took place near Fort Bragg, North Carolina, and involved the 82nd AD as well as two National Guard infantry divisions. True to the concepts established in the post war studies, gliders resupplied the 82nd AD in the field, delivering cargo but not personnel. This was the last training exercise in which gliders played

⁹ James A. Huston, *Out of the Blue: U.S. Army Airborne Operations in World War II* (West Lafayette, IN: Purdue University Studies, 1972), 242. Huston references a memorandum from Commanding General, Army Ground Forces to Chief of Staff, US Army, 19 October 1945 for the results of the study.

¹⁰ Huston, *Out of the Blue*, 242-243.

a part.¹¹ Attention quickly turned to operations in Korea that seemed, according to military planners, ill suited for glider operations. Korea featured US airborne operations but without the use of military gliders. In essence, the US glider program was nearly defunct and only awaited the executioner's final blow. The program did not have to wait long.

In June 1952, the Joint Airborne Troop Board, Fort Bragg, issued a memorandum stating, "Gliders, as an airborne capability, are obsolete, and should no longer be included in airborne techniques, concepts, and doctrine, or in references thereto." According to the board, assault transports had replaced gliders.¹² By January 1953, the US Army officially deleted glider landings from the list of capabilities of its airborne units.¹³ The US glider program, born out of response to the successes of Germany and the visions of Wingate and Arnold, ended with no more than a whimper. How could a capability so vital in one war become obsolete less than a decade later? Part of the answer surely lies in the technological advances made between 1941 and 1952. In a little more than a decade, technology spawned an atomic weapon and massive improvements in powered flight. What possible place could a simple wooden (or aluminum) glider have on an atomic battlefield that features jet-powered aircraft? Although technology played a prominent role in the extinction of the military glider, the service attitudes toward a powerless aircraft in both the US Air Force and US Army bear the most culpability. A review of these attitudes in the context of post-WWII, reveals that the cumulative efforts that harkened the demise of the US military glider program.

The Army-Air Force Split

In 1947, the US Air Force became independent of the Army and a National Security Establishment, later the Department of Defense in

¹¹ Devlin, *Silent Wings*, 373.

¹² John R. Galvin, *Air Assault: The Development of Airmobile Warfare* (New York: Hawthorn Books, 1969), 264.

¹³ Devlin, *Silent Wings*, 373.

1949, was formed to coordinate and control the services. The legislation formally established the roles and missions for each service and instituted their unique responsibilities. As might be expected, genuine disagreements over doctrinal issues arose between the Army and the Air Force as post-war fiscal limitations became a reality.¹⁴ Fortunately, the doctrinal issues of airborne warfare that plagued its development in the early years of WWII were finally resolved as the Army was mandated to organize and equip an airborne force. Additionally, the legislation directed that the Air Force to maintain adequate troop carrier units to support airborne operations incident to land operations.¹⁵ On the surface, the agreement finally established the roles and responsibilities for airborne warfare. Similar to WWII, the Army provided the soldiers while the Air Force provided the transportation. Yet, neither service believed that a robust glider program would promote its interests. One reason, according to Barry Posen, is that “organizations place a premium on predictability, stability, and certainty.”¹⁶ In this light, the glider did not serve any service’s interests, as the glider was not predictable, stable, or certain in combat. The US Air Force built its foundation on technology while the US Army focuses on the service of its citizen soldier.¹⁷ Unfortunately, the glider did not find a role in the foundations of either service. The Army and the Air Force had two different visions of the future and neither included the military glider.

Post-War Army Vision

Despite high casualty rates for airborne forces, the Army fought to keep it as an institution after World War II. The key to understanding why airborne forces survived the post-war reductions while gliders did

¹⁴ Richard I. Wolf, *The United States Air Force: Basic Documents on Roles and Missions* (Washington: Office of Air Force History, 1988) v.

¹⁵ Wolf, *Basic Documents on Roles and Missions*, 113-114, 159.

¹⁶ Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars* (Ithaca, NY: Cornell University Press, 1984), 46.

¹⁷ Carl H. Builder, *The Masks of War: American Military Styles in Strategy and Analysis* (Baltimore, MD: The John Hopkins University Press, 1989), 19-20.

not lies in the wartime status of each. Airborne paratroopers, unlike glider pilots, competed for the right to join an elite organization in the Army's eyes. The paratroopers had the pick of the Army's best and brightest officers—most of whom would have had stellar careers regardless of their organization. This elite status plus their hard earned combat record, afforded paratroopers an influential position in the post-war Army. In fact, three World War II airborne generals, Matthew Ridgeway, Maxwell Taylor, and William Westmoreland, became Chiefs of Staff of the Army.¹⁸ In effect, the leaders of the Army and the Air Force in the Cold War were men who led airborne divisions in WWII or commanded strategic bombing forces—not men who flew in gliders. Although numerous Army generals jumped into combat in WWII, only two flew in a glider—General Daniel Pratt, who was killed at Normandy when his glider crashed into a hedge row and General Anthony McAuliffe, commander of the 101st Airborne Division, who flew into Holland in a glider.¹⁹ This airborne mafia, bred from a cadre of distinguished ground officers, saw little utility for the military glider. To the leaders of the post-war Army, success came from riding a silk parachute not a wooden crate into battle. Still, Army leaders needed the benefits of mass, concentration, and precision provided by the glider—they found it in the emerging concept of the helicopter.

Operations in Burma, under the direction of General Wingate and Lieutenant Colonel Cochran, saw the first use of a helicopter in combat. The Sikorsky-built R4 helicopter was used initially for observation and reconnaissance, but Army leaders understood its potential to move troops and supplies rapidly.²⁰ Visionaries saw that the helicopter, like the glider, could land in locations not suitable for fixed-wing powered

¹⁸ Marc DeVore and Massachusetts Institute of Technology, *The Airborne Illusion: Institutions and the Evolution of Postwar Airborne Forces* (Cambridge, MA: Security Studies Program Massachusetts Institute of Technology, 2004), 24.

¹⁹ James E. Mrazek, *The Glider War* (New York, NY: St. Martin's Press, 1975), 284.

²⁰ Hickey, *Out of the Sky*, 137.

aircraft, delivering troops and ammunition. However, the helicopter, unlike most gliders, could perform more than one mission. When the Air Force broke from the Army in 1947, it meant that the Army lost nearly all of its assigned aircraft. Understanding that aircraft meant budget and personnel, Army officials were eager to maintain some aviation capability. In the years following the 1947 directive, the Army negotiated to retain aircraft deemed 'organic' to their mission such as light aircraft and helicopters. A later agreement, the Bradley-Vandenberg Agreement, allowed the Army to maintain helicopters up to 4,000 pounds in order to expedite and improve ground combat procedures in the forward battle area.²¹ The Army now had a suitable replacement for the glider that had all of its attributes—minus the silent descent. The Korean War galvanized the helicopter in the minds of Army leadership due to its ability to ferry troops, evacuate wounded, and resupply nearly inaccessible locations. The performance of the helicopter appeared better than the glider, however, only a few of the helicopter troop movements were in the face of the enemy and none of those missions came under fire—a luxury seldom afforded the glider in World War II.

The glider did not have an advocate in the US Army after WWII. The leadership that emerged from the war made their rank as airborne paratroopers not glider infantry. As the post-war restructuring of the services progressed, these leaders fought to maintain an airborne force without regard for gliders. The newly established Air Force provided the transportation for the paratroopers, while the Army and its new helicopter perfected the previous role of the glider. In the Army, new technology combined with organizational bias ensured the demise of the glider—a fate that was echoed in the US Air Force.

²¹ Wolf, *Basic Documents on Roles and Missions*, 237.

Post-War Air Force Vision

As the Army Air Force fought for and eventually attained independence, it began to stake its future on the strengths of its past—strategic bombing and tactical air support. Although the post-war agreements made the Air Force responsible for troop carrier squadrons to support Army airborne units, the Air Force seemed to treat air mobility as a secondary mission. Professionally, Air Force commanders became generals by flying bombers and fighters, not by flying the slow C-47, and certainly not by flying a glider. In fact, very few US glider pilots assigned to air transport units rose above the rank of major. Contrarily, the Germans had General Kurt Student and the British had Brigadier General Chatterton, both glider pilots who attained high rank.²² American glider pilots had no such advocate in the high ranks of the US Army or US Air Force. The military glider as an innovation, according to Stephen P. Rosen, could only survive if it attracted officers with solid credentials and made “it possible for younger officers to rise to positions of command while pursuing the innovation.”²³ The US glider program had neither senior officer support nor a career track for junior officers. Yet, it is likely that even high-ranking glider advocates would not have been enough to save the glider program in the era of long-range bombers and atomic/nuclear weapons.

In the tumultuous period after WWII, the Air Force chose to emphasize its long-range strike capabilities to deter enemy aggression. Improved mobility aircraft, while in development, did not receive the same attention as strategic bombers. The emphasis on the ability to project combat power was clearly stated in 1946 when General Carl Spaatz, then Commanding General of Strategic Air Forces, proscribed the Air Force mission as being able “to provide a long-range striking force in

²² Mrazek, *Glider War*, 283.

²³ Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca, NY: Cornell University Press, 1991), 96.

instant readiness...to reduce the enemy's industrial capacity and war-making potential.”²⁴ Additionally, the rapid development of 10,000 mile range bombers—the Northrup XB-35 and Consolidated XB-36—meant that America could project air power nearly worldwide. Air transport received only passing recognition and support—the glider program received virtually none. Fortunately, the Soviet Union's boisterous actions in Berlin meant that air transport would finally get some attention. The success of the Berlin Airlift enabled improvements in air transport that inevitably closed the door on the US glider program.

The Air Force, responsible for transporting airborne forces, began making improvements in transport aircraft. Beginning with the C-82 Packet, post-war transport aircraft were large and powerful enough to carry vehicles and featured a ramp for loading and unloading. Additionally, the C-82 and its successor the C-119 Boxcar, could airdrop vehicles on platforms suspended by parachutes. The Army airborne forces eagerly seized onto these capabilities and developed techniques for lifting and airdropping a wide range of vehicles and weapons. In World War II, the bulk of vehicles and heavy weapons in support of airborne forces were brought in via gliders—now powered transports could do the job.²⁵ Marking the realization of the decision to abandon gliders in future airborne operations, the Air Force ordered 244 C-123 Providers. The C-123, a propeller-powered derivative of the XCG-20 glider, was capable of landings and takeoffs from short and rough landing strips.²⁶

²⁴ House, *Military Establishment Appropriation Bill for 1948: Hearings before the Subcommittee of the Committee on Appropriations*, 80th Congress, 1st session, 1947, 600; as found in Robert Futrell, *Ideas, Concepts, and Doctrine: Basic Thinking in the United States Air Force 1907-1960* (Maxwell AFB, AL: Air University Press, 1989), 215

²⁵ Hickey, *Out of the Sky*, 183-184.

²⁶ Department of Defense, *Semiannual Report of the Secretary of Defense and the Semiannual Reports of the Secretary of the Army, Secretary of the Navy, and Secretary of the Air Force*, January 1 to June 30, 1952 (Washington: Government Printing Office, 1952), 242. See also *United States Air Force Statistical Digest FY 1952*, 163; History, Headquarters USAF, 1 July 1950 to 30 June 1951, 75-78; History, Tactical Air Command, 1 July to 1 November 1950, 362; History, Tactical Air Command, January to June 1952, 5:14-16; as found in Futrell, *Ideas, Concepts, and Doctrine*, 323

Advances in transport aircraft, capable now of lifting vehicles and heavy guns, made the glider obsolete in the eyes of both services.

The US Air Force did not advocate for the glider after World War II. Air Force senior leadership, although many saw the benefits of the glider WWII, promoted pilots of powered aircraft. The glider pilots lacked a senior officer who was in position to advance its cause and younger glider pilots remained at lower ranks, unable to influence senior leadership. Additionally, the Air Force was much more interested in what it believed was its highest priority—strategic bombing. Bombers, not transports, would protect American interests. When the powered transports progressed to the point of carrying and airdropping the equipment needed by the airborne forces, neither the Air Force nor the Army supported the continuation of the glider.

Conclusion

No single factor is responsible for the decline and elimination of the combat glider in the US. Financial costs contributed to the glider falling out of favor as the average price of a glider in WWII cost nearly \$26,000—an expensive bill considering the majority of gliders performed only one combat mission. Additionally, a myriad of unique conditions, influenced by both the US Air Force and the US Army, are to blame. The post-war Army had a powerful contingent of airborne officers who had made their mark by parachuting into battle—not riding a glider. The consensus among airborne officers was that the glider gave the individual soldier fewer options. Any number of things could happen to the glider before it reached the landing zone including tug aircraft problems, towrope breakage, pre-mature release, and ground fire. Even if the glider did reach the landing zone, a safe landing was normally the exception. US Army leadership viewed the developing technology of the helicopter as a more suitable aircraft for the missions previously reserved for the glider. Helicopters could carry men and equipment to austere locations and unlike the gliders, were reusable. Furthermore, advances in cargo

transports made the delivery of vehicles, supplies, and heavy weapons possible via parachute or landing on short, austere runways. The Army, satisfied with helicopter and post-war cargo aircraft, saw no need for a glider. This left the US Air Force to focus on its highest priorities—strategic bombing and atomic/nuclear weapons. Gliders without high-level support in the Air Force or Army truly became the “bastards no one wanted.”²⁷

²⁷ Mrazek, *Glider War*, 129.

Chapter 7

The Future of Gliders

Germany, the United Kingdom, and the United States each began World War II with vastly different experiences and expectations with military gliders. The Germans, forced to pursue power-less flight in the aftermath of the Versailles Treaty, entered WWII with an experienced cadre of glider pilots. By institutionalizing glider training in the inter-war period, the Germans were able to provide the *Luftwaffe* large numbers of qualified glider pilots before hostilities began. Both the US and the UK were not as prescient as both countries struggled to produce glider pilots and did so only after they witnessed the German success at Fort Eben Emael. Additionally, each country differed on its glider doctrine. The Germans, despite their successes in small, commando raids, eventually pursued a doctrine of large-scale glider operations. This doctrine, proposed by General Kurt Student, meant to combine the efforts of glider troops, paratroops, and air-landed infantry to overwhelm an opponent. Student's only opportunity to implement this doctrine ended poorly as the Germans suffered heavy casualties capturing Crete in Operation Mercury. After Crete, Germany scarcely used their gliders and only in small, commando roles.

The US and the UK had other visions for their gliders. The UK saw gliders as a way to augment their airborne forces by having paratroopers jump out of the gliders at the drop zone. This method would effectively double the number of paratroopers on a single pass. The US, from the outset, saw the glider as a means to support the airborne forces, which landed via parachute. The glider's role, according to American doctrine, was to land vehicles, heavy guns, and supplies necessary for the

paratroops to exploit their initial gains. As was the case with doctrine, the three countries also differed on key organizational issues.

Germany and Britain trained their glider pilots to fight as infantry upon landing. This differed greatly from the US as its pilots received very little ground training. American commanders expected their glider to stay out the heavy fighting as best they could. Many times the pilots guarded prisoners or directed traffic until they could return to their flying bases in England or France. The German and British glider pilots joined the fighting upon landing and undoubtedly shared a close bond with the airborne and glider troops they carried. Only in the CBI Theater did American glider pilots receive the training necessary to fight along side their infantry brothers. The division between pilots and ground troops in American doctrine only grew wider as the Army and the Air Force separated in 1947. This separation further exasperated the lack of institutional backing of gliders in both the US Army and the US Air Force. Without government support for gliders, military planners turned to the helicopter, paratroopers, and cargo aircraft to replace the capabilities of the glider.

Presently, the bulk of the glider's military application is flight familiarization for students at the United States Air Force Academy. However, the current irregular warfare environment might mean its time to rethink the glider's military application. A potential modern use of the glider is in a rebirth of its commando role. Today's special operations forces (SOF) gliders might be perfectly suited for the unconventional operations especially when localized mass and surprise are the main objectives. Gliders, along with helicopters, are designed specifically to land on unprepared terrain. However, unlike the helicopter, the glider remains virtually silent in flight and during descent into the objective area. The silent approach and close landing are beneficial capabilities in the modern environment, just as it was at Eban Emael and other World War II landing zones. Modern helicopters, capable of carrying an assault

force of at least ten soldiers, are noisy. Lacking a silent approach, SOF planners often require the helicopter to drop the assaulters off outside the acoustic range of the objective in an attempt to maintain surprise. Once the drop-off is made, ground troops must make their way overland to the objective, another procedure that potentially threatens the integrity of the operation. When helicopter insertion is not suitable, SOF planners can use an airborne operation. However, the noise of the airdrop aircraft presents the same problems as the helicopter. Alternatively, a high-altitude parachute drop can be used to reduce the acoustic signature but has its own complications. Parachute drops, especially at night, can cause great dispersion of the forces. Additionally, high-altitude drops subject the jumper to the effects of high altitude and potentially long times under canopy—allowing the assaulters to drift miles from their intended drop zones. The glider, although not suitable in every situation, could play a major role in missions requiring a concentrated force landing near an objective.

Although gliders are perfectly suited for missions without a robust air defense, they could even have a role against modern integrated air defenses. As the lethality of surface to air missiles (SAM) increases, American engineers have sought increasingly expensive technologies to defeat them. Stealthy B-2 bombers and F-22 fighters help negate the abilities of the modern SAM, but these assets come at extremely high costs. Gliders, made of composite material, would be nearly invisible to radar. An assault force, loaded on gliders, could land and neutralize the radar and ground stations that serve the high-threat SAM. The concept would be similar in design to the British glider force that assaulted and neutralized the heavy guns at Merville prior to the D-Day invasion. If glider forces deactivate key SAM sites, it could open a corridor for conventional, non-stealth aircraft to begin an air campaign. Gliders could potentially reduce the advantages countries have with modern integrated air defenses while putting only a few lives at stake. Gliders

could provide decision makers another tool—one that is truly unconventional in today’s modern military and one that could possibly yield tremendous asymmetrical advantages.

The same characteristics that made gliders attractive to the German and Allied forces in WWII are still enticing today. Despite all of the technologies available today, the glider still offers many advantages not found in the helicopter, parachute, or cargo aircraft. The events of 9/11 have sparked a rebirth of unconventional thinking and combat application in US military forces. The glider remains a viable platform for limited, specific missions requiring silence, mass, and surprise.

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