THE FALL OF FORT EBEN EMAEL: THE EFFECTS OF EMERGING TECHNOLOGIES ON THE SUCCESSFUL COMPLETION OF MILITARY OBJECTIVES

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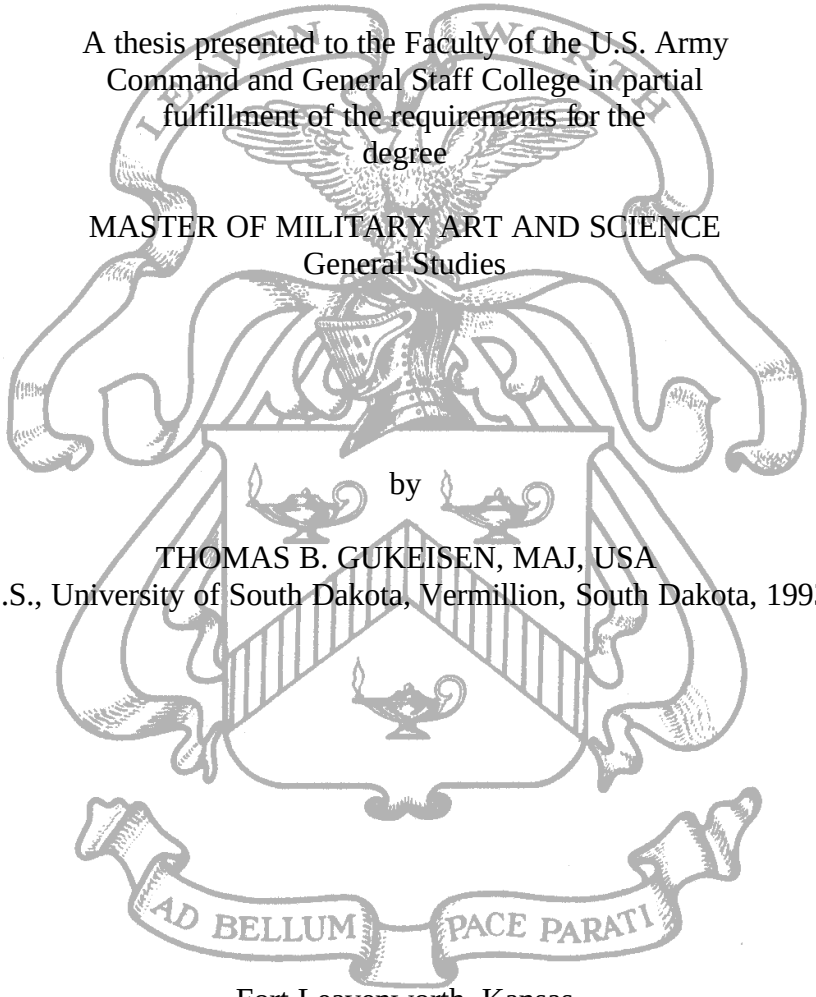

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the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

ABSTRACT

THE FALL OF FORT EBEN EMAEL: THE EFFECTS OF EMERGING TECHNOLOGIES ON THE SUCCESSFUL COMPLETION OF MILITARY OBJECTIVES, by MAJ Thomas B. Gukeisen, 81 pages.

This study details the events of 10 May 1940 at Fort Eben Emael, Belgium, and the elements which led to the successful seizure of the fort by the German military. The central focus of this thesis is the following question: Was the use of emerging technologies the key to victory at Fort Eben Emael? First, the study focuses on the technologies themselves. Secondly, this study examines the leadership and training of the German unit assigned the mission at Fort Eben Emael. Lastly, this study examines administration and personnel issues that existed for the Belgians stationed at Fort Eben Emael. This study determined that the glider did afford troops the advantage of surprise; however, the hollow charge failed to live up to its reputation as it was most effective when used in such a way that it was no different than a conventional charge. Further, the German unit's training and leadership was exemplary and contributed more to the mission's success than the technologies the unit employed. Additionally, Fort Eben Emael was faced with serious internal issues that prevented a successful defense of the fort. Therefore, this thesis concludes that emerging technologies were not the most crucial component contributing to mission success.

ACKNOWLEDGMENTS

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CHAPTER 1

INTRODUCTION

In the 1930s Europe was troubled with economic depressions that led to the rise of nationalistic powers that became increasingly revolutionary and aggressive in nature. Belgium, knowing what happened in the Great War and four years of enemy occupation, took certain measures to strengthen its defenses. Parliament passed a plan for restoring, modernizing, and constructing fortifications and in 1932 the construction of Fort Eben Emael began. Politically, Belgium entered into many agreements in hopes of handling future conflicts in the region. Experience had taught Belgium that, in spite of declarations, promises, and agreements, she would be in great danger in the event of European conflict. On 3 September 1939, France and Britain declared war on Germany for invading Poland.

By Belgium declaring neutrality in 1936, she could not form a joint defensive policy with France and Britain. General Maurice Gamelin, Chief of the General Staff of National Defense for France, developed Plan D in 1939 to counter a repeat of the German 1914 Schlieffen Plan. Given the solid bastion of the Maginot Line, Plan D focused on countering a German attack through France's northern flank.

General Gamelin was a veteran of World War I and therefore had been impressed by the rewards of a defensive approach. Plan D called for a defense along the Dyle Line (so named for the Dyle River which runs from Antwerp to Namur). The river, coupled with French planners' hopes of the Belgian border fortifications holding for five days, would allow French and British forces to assemble east of the Dyle Line and stop a German advance.

The most modern and strongest of the Belgian forts at the time, Fort Eben Emael was considered, by many, impossible to capture. Named for the nearby villages of Eben and Emael, the fort was constructed from 1932 to 1935 on a granite ridge overlooking the Meuse River and Albert Canal. Eben Emael was one of the twelve forts around Liège that dominated eastern Belgium, and its primary mission was defending the bridges over the river Meuse and the Albert Canal. This fortress posed a barrier for any invading force and could only be attacked, with any degree of success, by a specially designed and equipped force.

German Military Development (Interwar Period)

During the interwar period, German doctrine made a radical shift away from static attrition based warfare. Strategy had to link military campaigns to goals and means. "Individual battles at multiple fronts had to be integrated into an operational design that added movement to the direction of the overarching strategy."[1] The German military went through a dramatic strategic modernization plan that is best described as an institutional triangle. The plan made a strong impact on the public, on the attitudes of workers, and on technocratic rule. Military work and politics became inseparable. In parallel to physical modernization the German staff system opened to debate and innovation. This radical thinking opened the chain of command with its emphasis on decision making at the front battle zone line and optimal use of weapons shaped command and deployment.

The substitution of machines for men forced the adaptation of the army to the new German war machine. Operational planning and strategy became a matter of management of arms. It is this system that made the German military the most radical exponents of

machine culture in the military.[2] This formation of a military machine strategic culture linked the military organization and operation to industry and popular mobilization, gave unprecedented freedom and independence to lower echelon front officers, and linked morale to popular sentiment.

The Army High Command OKH (Oberkommando des Herres) began a radical triad of military reform in support of this new form of warfare. First, the force was restructured beginning with infantry squads that consisted of nine men and one noncommissioned officer with an MG 34 machine gun. Panzer divisions were teamed with light infantry forces to form the backbone of mechanized units. The OKH also recognized the importance of training the force, but unlike previously, the major purpose was to develop mid level and junior officers and noncommissioned officers. The training emphasized decentralization and initiation through auftragstaktik, or mission-oriented tactics. Lastly, the OKH published numerous field service regulations that were validated through extensive training exercises. These regulations recognized the importance of a combined arms attack and emphasized maneuver over fire. Reserve forces were used to reinforce success and exploit gains before the enemy could react.

The use of airborne forces fit perfectly into the new blitzkrieg concept, as they could destroy or hold key points until ground forces arrived. A detailed examination of the development of German airborne forces lies beyond the scope of this thesis. It is of particular importance to the topic at hand that in June 1939 a conference of senior airborne officials determined a need for a specialty trained and equipped unit to conduct high-risk operations and that under certain circumstances the normal dispersal of airborne forces would result in mission failure. The conference attendee's solution to this problem

was the silent, cheap, glider. Testing on prototypes began immediately and shortly thereafter the DFS-230 troop carrying glider was being built in large numbers.[3] By 1939 the Luftwaffe recruited the best pilots from the many civilian glider clubs throughout Germany; entrance into the military glider program required a candidate to land his glider within sixty feet of a target. By April 1940 General Kurt Student's 7th Airborne Division grew to 4,000 airborne troops, 12,000 airland glider soldiers, and 1,000 JU-52 transport aircraft.

Summarily, the new concept of warfare developed at that time is described today as blitzkrieg.

> The Blitzkrieg stressed mobility and speed over firepower, although in the form of the tank, the dive bomber, and high-velocity antitank or antiaircraft gun it aimed for great firepower at decisive points. Blitzkrieg welcomed encounter battles. It employed concentrated air power offensively and defensively, to prepare the way for advancing armor. Like German doctrine after WW I, Blitzkrieg stressed infiltration tactics and flanking movements for both infantry and armor. As in the classic pre-WWI doctrine, the new doctrine sought single and double envelopments, it aimed as much at the disorientation and dislocation of the enemy command system as it did at the annihilation of enemy forces. This was to be achieved by deep penetrations into the rear area of an enemy army. It was believed that if dislocation could be achieved, the battle of annihilation might be avoided, or at least easier.[4]

The revolution in military affairs in the German Army "represents a remarkable example of a highly skilled professional group, small in number, performing military work rapidly and efficiently. That effort no doubt played a significant role in the subsequent campaign in the West."[5]

French and Belgian Military Development (Interwar Period)

The First World War devastated France and Belgium, and both naturally gravitated to a defensive, coalition supported strategy. The strategic goal of the two countries was the avoidance of defeat, rather than an immediate victory. They both

sought security through military accords, agreements, and alliances. Throughout history, Belgium has been geographically unfortunate as it connects major European cities with ideal rail and road networks. In 1920, the Belgian and French General Staffs reached an agreement solidifying the details of military cooperation in the event of an unprovoked attack by Germany. “Belgium could be either a sluice gate to pour German forces into France or a dike to hold back a military advance.”[6] This mutual cooperation shaped the military for both countries and for this reason it is important to discuss French strategy in conjunction with Belgium.

Senior French leaders recognized the necessity to defend the national territory by placing fortifications along her border. Fortifications would enable a smaller number of soldiers to fight more effectively until the allies could mount an offensive. Since the location of the majority of France’s industrial base, natural resources, and population were in the northeast, it was only natural to build the fortifications along those borders. If they were lost to Germany, mobilization would be disrupted and the ability to wage war would be seriously threatened. The 1920 Superior Council of War concluded to build the fortifications and establish a forward defense in northern and central Belgium. “This strategy enabled France to overcome the significant disadvantages she had relative to Germany.”[7] Secondly, the council maintained the preference to fight the next war on Belgian soil in the north, rather than on French soil. Both politically and militarily, this remained the ethos of strategy throughout the interwar period.

Within Belgium, debate over the defense strategy ensued. The Belgian Army leadership accepted the French plan and began detailed defensive initiatives that called for Belgian soldiers to occupy fortifications and then to wait for the allied forces to move

into the country, trading space for time. The Minister of Defense backed by public opinion, found it unacceptable to give up any part of the country, the Ardennes in particular, and fought for static defenses along the border. After the intervention of King Leopold III, a compromise was reached and work began to restore and modernize current fortifications and then combine them with a newly built series of networked bunkers on the border and special light infantry units were created that could act as a mobile area defense force. By 1935 these measures were almost complete. Both France and Britain finally recognized that Belgium was doing her utmost to fulfill her function in this part of Europe.

In 1936, the international situation deteriorated when German troops occupied the left bank of the Rhine. Experience had taught Belgium that, in spite of declarations and solemn undertakings, it would be in grave danger of being used once again as the battlefield of the Great Powers in the event of a European conflict. It became clear that Belgium would have to adjust its foreign policy, and on 14 October 1936 King Leopold III proclaimed the Independence Policy. By declaring neutrality, Belgium was prohibited from consultations with other countries and subject to many Articles of the Hague Convention that affected economic prosperity. Fearing that the French would not honor the Dyle Plan, the Belgium general staff developed a plan to delay the Germans with the existing fortifications at the border and stop them in depth at the Koningsooikt Wavre line (KW line). The KW line was a series of newly constructed fortified positions that ran from Antwerp through Brussels and ended in Namur.

In August 1939, war seemed imminent, and Belgium started to mobilize. Leaves were canceled, reserve units activated, and all private and foreign aircraft were prohibited

from flying over Belgium. On 1 September 1939, Germany invaded Poland and three days later King Leopold III took command of the Army and the start of the Phony War began. By mid-September, mobilization was proceeding systematically and about fifty divisions had been called up. Once the Polish campaign was over, Germany moved additional troops to the Belgium and Netherlands border forcing the Belgian Army Command to progressively increase its precautionary measures and conduct numerous alert drills.

> The time for innovation and modernization had long since passed to Germany. As early as 1936, France could only react to Hitler's actions. Other than returning Britain to its side [French] policy had created little more than a fragile shield that the Germans could easily crack. France's best efforts had failed to provide security.[8]

Dyle Plan

Caught by surprise in 1914 by the German Schlieffen Plan, the French had produced numerous studies and plans to prevent such a thing from reoccurring. The 1920 Superior Council of War principally concluded that France would defend the national territory by holding German forces along the north east through fortifications and place a minimum number of forces in the Ardennes. Once Germany attacked through Belgium, the French would rush into northern and central Belgium and occupy strong defensive positions. After weakening the enemy and building the force, the alliance would resume the offensive and achieve victory. However, it was not until 1932 that Maréchal Pétain, President of the French War Council, stressed the importance of having a mobile force near the border to ensure a swift advance into Belgium. Originally, the French High Command and the Chief of the General Staff of National Defense, General Gamelin, opposed the move into Belgium. Politically, it was more favorable for the French if the

Germans attacked through Belgium. Militarily it would add twenty-two Belgian Divisions to the Allied force, shorten the front by thirty-five miles, keep the German Army away from the industrial region in the northeast, and keep the German Luftwaffe away from the English Channel. Feeling political pressure and acknowledging the strategic value of Belgium, General Gamelin developed Plan D in September 1939 which was approved as Plan Dyle on 14 November 1939.

The Dyle Plan called for four of the five Anglo-French armies to advance into Belgium. The disposition of forces reflected the expectation that the major German effort would penetrate through the Gembloux Gap, the area from the left bank of the Meuse River near Liège to Namur in the north. French General Henri Giraud's Seventh Army would advance as far as Breda in the Netherlands and link up with the Dutch Army, creating a defensive line from Breda to Antwerp, Belgium, a thirty-five-mile front. The Belgian Army would occupy positions from Antwerp to Louvain, just east of Brussels, covering roughly forty miles. To the right of the Belgian Army was General John Lord Gort of the British Expeditionary Force (BEF), who positioned his forces on a fifteen-mile approach south of Louvain along the Dyle River to Wavre, Belgium.[9] The French First Army, commanded by General Jean-Georges Maurice Blanchard, would have the responsibility of blocking a likely German attack through the Gembloux Gap. This gap is a thirty-mile corridor stretching from Wavre to Namur, Belgium, that accommodated a rapid advance of motorized forces between the Dyle and Meuse rivers. From Namur to Sedan, France, General André Corap's French Ninth Army would advance along a seventy-mile front and anchor its right wing on French soil. To his right, from Sedan to Longuyon, France, the French Second Army, under General Charles Huntziger, would

remain stationary and defend a forty-five mile front. The command of this 230-mile front consisting of forty divisions came under the 1st Army Group, General Gaston Billotte. General Gaston Prételat and his 2nd Army Group, with thirty-seven divisions, would defend within fortifications from Longuyon to the Alsace region. The 3rd Army Group, commanded by General Antoine Besson, tied in fortification units with the 2nd Army Group and defended the remaining area to the Swiss border. Commander in Chief of the North-East Front, which included the 1st, 2nd, 3rd, Army Groups, and eighteen reserve divisions, was French General Alphonse-Joseph Georges.

General Georges argued vigorously against the Dyle Plan. His analysis concluded that his 1st Army Group would not have enough time to prepare defensive positions in Belgium; the 2nd Army Group had roughly the same number of divisions defending a much smaller front. By committing the 7th Army into the Netherlands, Gamelin took away the only available reserve army. This would leave the center, opposite the Ardennes Forest, unoccupied. Gamelin wrote, “If the main enemy attack came in our center, on our front between the Meuse and the Moselle, we could be deprived of the necessary means to repel it.”[10] Criticism continued throughout the French High Command, but the French strategy did not rely solely on the Dyle Plan. The Maginot Line was constructed to force the Germans to mount a costly frontal attack or attempt to outflank the fortification through Belgium or Switzerland. The Dyle Plan was the response to the more likely of the two flanks, but an attack on Switzerland remained a possibility and therefore Gamelin stationed the 3rd Army Group along the Swiss border as an economy of force. There was also a possibility that an German attack through Belgium would be a feint and that the

major attack would be on the Maginot Line. The 2nd Army Group required a sizeable force to conduct a counterattack.

On the morning of 10 January 1940 engine failure forced a German ME 108 plane carrying a detailed plan of a pending invasion of Belgium and the Netherlands to land in a deserted field just inside Mass-Mechelen, Belgium. During a council of war a few days later, the French High Command concluded these documents were genuine, and this reinforced their belief that the main German offensive would come through northern Belgium.

In March 1940, Gamelin was informed that seven of the ten German panzer divisions were positioned between Sedan and Namur conducting maneuver exercises. A month later the Allies received a final report that a German attack would commence between 8 and 10 May with Sedan being the center. General Gamelin did not believe that the main German attack would come through the Ardennes; the roads were narrow and winding throughout a dense forest among rugged terrain. “Gamelin simply did not envision abandoning the Dyle Plan.”[11]

Plan Yellow

On 27 September 1939 Poland was defeated and Hitler informed the General Staff of his decision to invade France. One month later, General Walther von Brauchitsch, Commander in Chief, and his Chief of Staff General Franz Halder briefed Hitler on an enlarged Schlieffen Plan. The plan was to outflank the Maginot Line to the north with the bulk of the Army attacking through the Netherlands and Belgium. A smaller force would negotiate the Ardennes and attack into Eastern France. The October 1939 Plan was

criticized by General Erich von Manstein, Chief of Staff for Army Group A, and General Heinz Guderian, XIX Panzer Corps Commander.

After the plan was compromised by the emergency plane landing in January 1940, Hitler was forced to seek alternatives. General von Manstein proposed the attack into the Netherlands and Belgium as a supporting attack with the main effort going through the Ardennes near Sedan. By doing this, Manstein concluded that the attack would focus on the weakest point of the French defense and cause a split, then a separation of forces in France and Belgium, thereby allowing the German Army to envelope using a powerful right hook. The OKH voiced concerns that the terrain in the Ardennes could not support a large mechanized attack. Nonetheless, Hitler backed the plan.

On 24 February 1940 the fifth and final version of Plan Yellow was issued. The plan called for Army Group A, under General Gerd von Rundstedt, to break through the Allied center and attack toward Abbeville, France[12] with forty-five divisions, including seven of the ten panzer divisions. Army Group B, commanded by General Fedor von Bock, would attack into Belgium and the Netherlands with twenty-nine divisions including the remaining three panzers and draw the French and British to the Dyle Line which, in turn, protected Army Group A's flank. General Ewald von Kleist, commander of Army Group C, would attack the Maginot Line with nineteen divisions to prevent the French from repositioning forces against Army Group A (figure 1).

This plan would work only if the Allied forces committed to the Dyle Line. Success of Army Group B's feint depended on swift movement to the Gembloux Gap. Although the gap was ideal for maneuver warfare, to reach it one had to first cross the Meuse River and the Albert Canal, which ran parallel to it. The Albert Canal had three

bridges at Veldwezelt, Vroenhoven, and Canne. These would have to be captured intact prior to any German advance. Suitable drop and landing zones existed near the bridges, and Belgian defenders were not considered a problem. The real problem was Fort Eben Emael, one of the most powerful fortifications in Europe, which had the ability to destroy the bridges with its artillery. “The whole operational concept hinged on the destruction of Fort Eben Emael and the capture of the Albert Canal bridges, at the very beginning of the campaign.”[13]

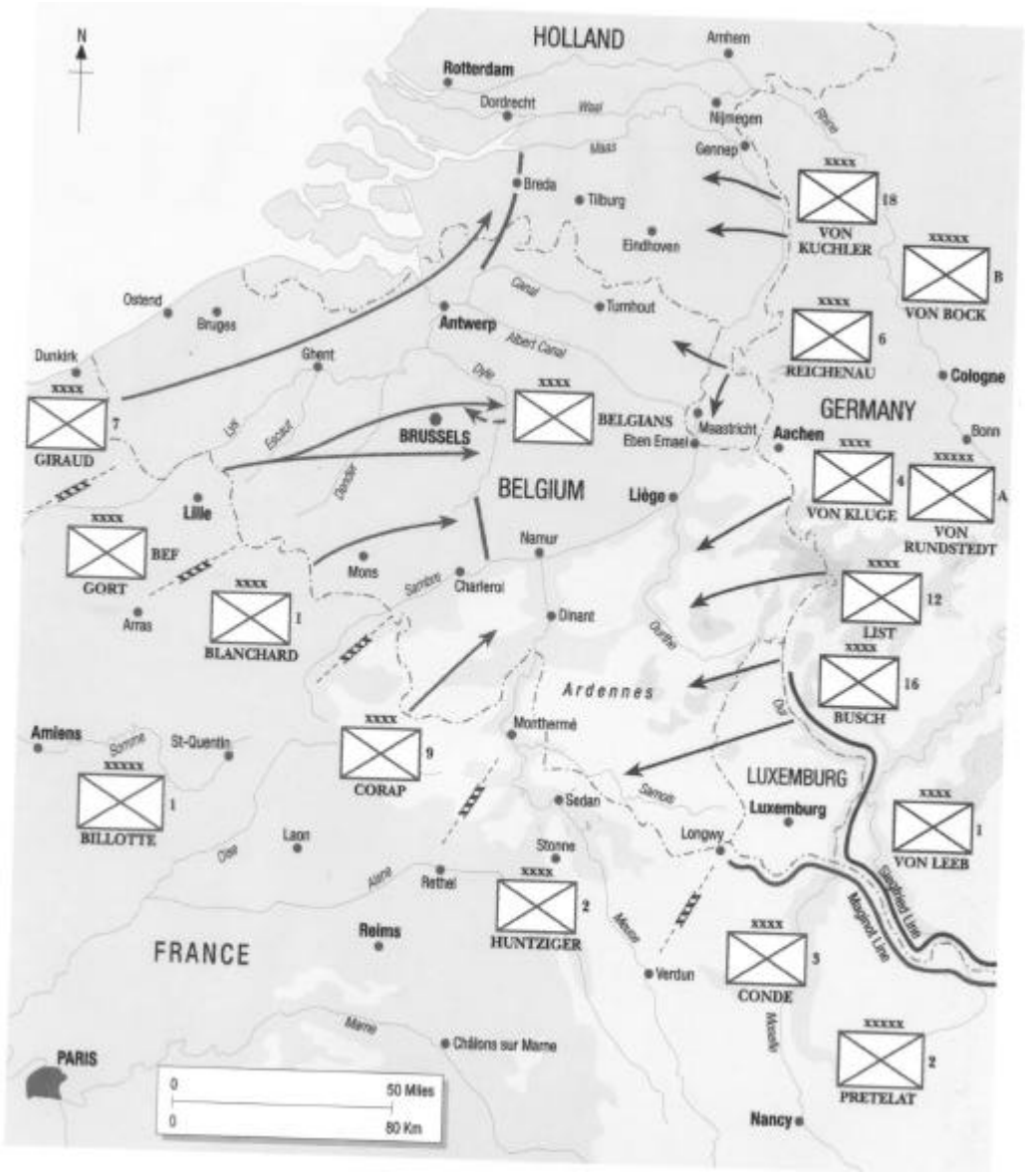

Figure 1. The Invasion of France and the Low Countries May 1940

Source: Martin Evans, *The Fall of France Act With Daring* (Oxford: Osprey Publishing, 2000), 4

Fort Eben Emael

Before World War I, the Belgian fort designer, Henri Brialmont, identified the "Gap of Vise" as being of such vital strategic importance that a decision not to construct

a fort to cover that area was one over which the Belgian nation would "weep tears of blood."[14] Ironically, General von Kluck's 1st German Army crossed the Maas River not far from Fort Eben Emael in 1914. The Albert Canal, completed in 1929, connects the important industrial region around Liège with the port of Antwerp, Belgium. This feat of engineering produced near vertical cliffs along the Caster hill near the towns of Eben and Emael. These newly constructed cliffs, coupled with an existing cliff along the Meuse River, provided protection for two flanks and an ideal location for a fortification. In April 1932, construction began and continued at a relentless pace until its completion in 1935.

Eben Emael, a diamond shaped fort measured 1,200 yards north to south and 800 yards at it widest point, was a reinforced artillery position that had a commanding view of the countryside. Its mission was to protect the Vise Gap to the south, the road and bridge network in the north, the Albert Canal due east, and lastly if required, Belgium to the west. For external defense, a water ditch was constructed in the northwest and in the south a twenty-foot-high antitank ditch. Antiaircraft positions, machine gun emplacements, and blockhouses completed the seemingly impregnable fortress.

The fort, with an authorized strength of 1,322 men, had only 1,198 on the strength report on 10 May 1940.[15] They were roughly separated into two groups of 500 artillery men and 200 technical and administrative workers.[16] Major Jean Fritz Lucien Jottrand commanded the fort and the Regiment of the Fortress of Liège was the next higher headquarters. Armament of the fort was divided into two batteries. Battery 1 was composed of the artillery cupolas and casements while battery 2 focused on the defense bunkers hereon named blocks. Battery 1 consisted of the cupola 120, a nonretractable cupola with two 120-millimeter guns revolving 360-degrees with a range of eleven miles;

two 75-millimeter cupolas named Nord and Sud, retractable with two revolving 360-degree guns each with a seven-mile range; four casements with three 75-millimeter guns each, capable of firing five miles, but only at a seventy degree arc, hereon named Maastricht 1 and 2 oriented north and Vise 1 and 2 south. Battery 2 consisted of ten blocks with one or two 60-millimeter antitank guns (except for Mi-north and Mi-south), 30-caliber machine guns, searchlights, and a small observation cupola. On the top of the fort were seven antiaircraft machine guns, three false cupolas, and three large cupolas named Eben 1, 2, and 3. The cupolas were primary observation platforms for the forts in Liege and are structurally separated from the buildings they were built upon.[17] Six observation cupolas were spread in the neighboring countryside overlooking the Albert Canal and its bridges. Inside the seven-miles of tunnels, Fort Eben Emael was divided into two levels. The ground floor contained the barracks, machinery, and generators for the heating, air conditioning, overpressure, and decontamination system, as well as water purification from its internal well and hospital. The intermediate level directly supported the batteries with fire direction control, command and control, and ammunition storage. Fort Eben Emael was the impregnable key to the Belgian defense system that was one of the most powerful fortifications in Europe.

German military planners recognized this; therefore, special means of neutralizing the fort were required (figure 2).

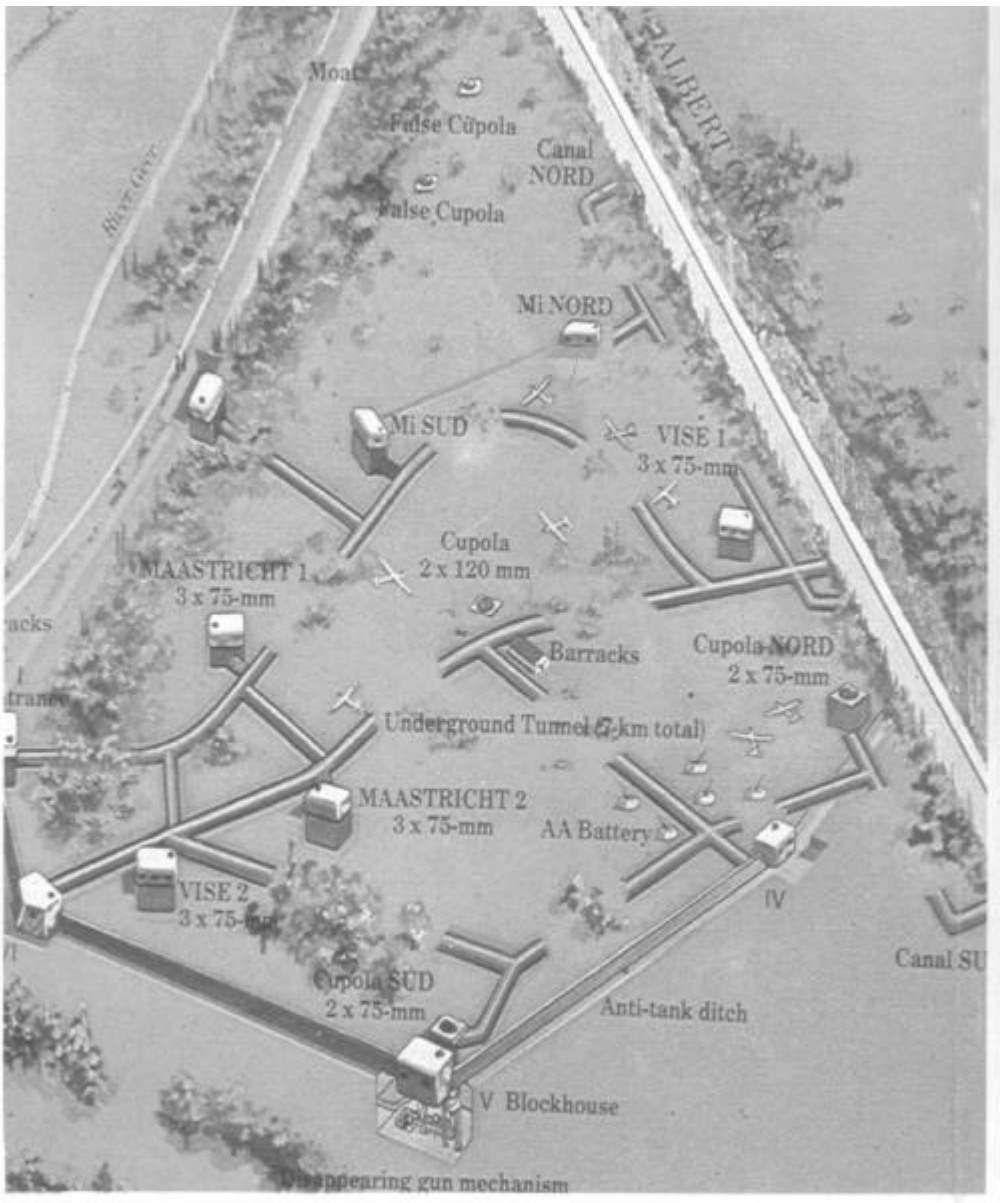

Figure 2. Assault on Eben Emael

Source: René Vliegen, "*Fort Eben Emael*" (Belgium: ASBL Fort Eben Emael, 1993), back cover.

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[1]Michael Geyer, *Makers of Modern Strategy from Machiavelli to the Nuclear Age* (New Jersey: Princeton University Press, 1986), 537.

[2]Ibid, 541.

[3]The DFS 230 was built by the Duetsche Forschungsanstalt für Selgelflug under the Gotha Wagen Factory with a payload capacity of 2000 pounds and troop capacity of 10 men.

[4]Barry Posen, *The Sources of Military Doctrine: France, Britain, and Germany between the World Wars* (London: Cornell University Press, 1984), 86.

[5]Samuel J. Lewis, *Reflections on German Military Reform* (Fort Leavenworth: CGSOC H100 Student Text, U.S. Army Command and General Staff College, 2003), 179.

[6]James E. Mrazek, *The Fall of Eben Emael* (New York: Robert E. Luce, Inc., 1970), 15.

[7]Robert Doughty, *The Breaking Point: Sedan and the Fall of France, 1940* (Fort Leavenworth: CGSOC H100 Student Text, U.S. Army Command and General Staff College, 2003), 191.

[8]Robert Doughty, *The Making of Strategy* (New York: Cambridge University Press, 1994), 497.

[9]Wavre, Belgium, is located just south Brussels.

[10]Ronald Powaski, "Cut of Sickle," *World War II Magazine*, November 2003, 59.

[11]Ibid., 60.

[12]Abbeville is 100 miles north of Paris near the English Channel.

[13]T. N. Mout, "A New Method of Attack: The German assault on Eben Emael, 10 May 1940," *Osprey Military Journal* 2, no. 3 (2000): 14.

[14]Named for the Belgian town of Vise; the southern area of Belgium between Liège and Maastricht, The Netherlands.

[15]J. A. Fievez, Association for the Preservation of Fort Eben Emael, Interview by author, 18 February 2004, Maastricht, The Netherlands.

[16]Exact numbers remain unknown because these documents were destroyed prior to the surrender of Fort Eben Emael.

[17]Eben 1 had a Liege Observation Point number 274 and is built on Block 01.
Eben 2 had a Liege Observation Point number 0.334 and is built on Mi-Nord.
Eben 3 had a Liege Observation Point number A335 and is built on Maastricht 2.

CHAPTER 2

REVIEW OF LITERATURE

Very little documentation exists for the capture and surrender of Fort Eben Emael, and many base their work on those few sources. The information pertinent to this thesis is derived from many primary source documents obtained from both the Belgian and German armies. These first-hand accounts include after-action reports, operations orders, transcripts of interviews, and transcribed radio messages. Secondary sources fall into two general categories, those that detail the events of seizing Fort Eben Emael and those that provide a foundation for the historical account of the fall of France. The secondary source material proved invaluable in harmonizing primary sources.

Of the primary sources, the most valuable are those written by Rudolf Witzig, the assault platoon leader. The Beurteilung der Lage (Operations Order), written on 12 January 1940 provides the basis of comparison for how the operation was planned versus how it was executed. This document was written two days after the Mass-Mechelen incident after Hitler summoned the key players to discuss the attack on Fort Eben Emael and the Albert Canal bridges. In 1954, now a major, Witzig wrote "Die Einnahme von Eben Emael" (The seizing of Eben Emael) and in 1966 he wrote another article which summarized the events surrounding 10 May 1940 titled "Coup from the Air: the capture of Fort Eben Emael" for *History of the Second World War Magazine*. Given the two articles were written over fourteen years after the event, Witzig's account is detailed, insightful, and provided him the opportunity to capture and characterize his remarkable accomplishments. *Belgium: The Official Account of What Happened 1939-1940*, published by the Belgian Ministry of Foreign Affairs in 1944, describes the mission

assigned to Belgium in agreement with the neighboring powers through documents arranged in chronological order. These documents are indispensable to a researcher looking to peer into the country's military and governmental actions prior to her invasion. *N-15860 Statements of Generals of Former German Army*, published in 1947 and available in the Combined Arms Research Library, was the only primary source found that acknowledged Hitler's role in the operations of Fort Eben Emael.

Of the secondary sources that examined the events of seizing Fort Eben Emael, James E. Mrazek's book *The Fall of Eben Emael* (1970) has proven the most valuable. The author does a tremendous job of detailing the events of 10 May 1940; and through his numerous interviews, with both Belgian and German soldiers involved in the action, Mrazek is able to capture many details lost through the natural progression of time.[1] Rene Vliegen's book *Fort Eben Emael* (1993) contains many pictures, diagrams, and charts that prove helpful in understanding the complexity of the fort's construction, armament, and defensive capability. The strength of this work lies in the details and anecdotal accounts of the attack. Numerous interviews and correspondence with J. A. Fievez, member of the Fort Eben Emael preservation society, are invaluable in answering research questions and validating assumptions through historical evidence. Mr. Fievez lived in a town neighboring the fort on 10 May 1940 and has studied the attack on Fort Eben Emael all his life. His collection of interviews and governme nt and historical documentation from Germany, Belgium, and the Netherlands, coupled with his knowledge contributed immeasurably to this thesis.

The most valuable secondary source that did not deal exclusively with Fort Eben Emael was Jean Paul Pallud's *Blitzkrieg In The West Then and Now* (1991). This book is

one of the most extensive accounts of the events leading up to, the invasion of, and the surrenders of both France and Belgium. The book took over five years to compile and spans over 600 pages; it is a testament to Jean Paul Pallud's fascination with the blitzkrieg and contains detailed descriptions of units and events. The use of comparison photographs between time period and modern day furthers the understanding and appreciation for historically accurate documentation. William McRaven's "Spec Ops Case Studies in Special Operations Warfare: Theory and Practice" (1995), written as a Naval Postgraduate School thesis, provides useful analysis when applied to the six principles of special operations. McRaven's interviews with Rudolf Witzig and Helmut Wenzel, the two most critical German leaders involved in the seizure of Fort Eben Emael, make this a key source.

While researching the doctrinal foundation and the development of German, French, and Belgian strategy and operational design, several sources formed the basis for research. These sources include the following:

1. Christopher Ailsby, *Hitler's Sky Warriors German Paratroopers in Action 1939-1945*, 2000

2. Robert Doughty, *The Breaking Point and the Fall of France, 1940*, 2003

3. Robert Doughty, *The Making of Strategy*, 1994

4. Michael Geyer, German Strategy in the Age of Machine Warfare, 1914-1945, 1986

5. Barry Posen, The Sources of Military Doctrine: France, Britain, and Germany between the World Wars, 1984

6. Samuel J. Lewis, *Reflections on German Military Reform*, 2003

7. Ronald Powaski, Ronald, “Cut of the Sickle,” 2003

Numerous articles appear in military journals and magazines which focus on specific aspects of the operation. For example T. N. Mout, “A New Method of Attack: The German assault on Eben Emael, 10 May 1940,” *Osprey Military Journal* Volume 2, Number 3 (2000), details the use and effectiveness of the hollow charge. Internet references are error prone, poorly written, or shortened versions of James E. Mrazek’s book *The Fall of Eben Emael* and therefore not used in this thesis. The only exception is the web site maintained by the Fort Eben Emael preservation society.

Finally, the amount of reference material is limited and that which is available is generally riddled with errors. One must understand that the authors do not intentionally present erroneous information, but rather base their knowledge on the limited material available. The specifics of the seizure of Fort Eben Emael were not known until long after the war. This is due largely in part to the German desire not to let the Allies know of their use of emerging technologies, in particular the glider and hollow charge. Soon after the fort was neutralized, the German propaganda machine released a movie demonstrating its seizure, however it showed a large number airborne troops parachuting on top of the fort and using hand grenades and flame throwers to destroy the cupolas and bunkers.

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[1]As of 14 February 2004, only three German soldiers involved in seizing Fort Eben Emael are still alive.

CHAPTER 3

PLANNING THE OPERATION

On 27 October 1939 General Kurt Student, commander of the 7th Airborne Division, was summoned to Berlin for a meeting with Hitler. After Student arrived, Hitler pointed to a Belgian fort on the map and gave this brief description: "The top is like a large grassy field. It has some surface fortifications; there are heavy artillery gun cupolas, casements, and some machine guns."[1] Hitler then asked Student if gliders could land on top of the fort, carrying a force that could storm the fortification, and employ the new hollow charge. The innovative hollow charge was a device capable of destroying any known military armament, be it steel or concrete. Hitler, after hearing stories as a corporal in World War I, knew that siege warfare was a costly undertaking. He recited the story of seizing Fort Douaumont during the Verdun campaign to General Student. Fort Douaumont was recaptured by French Colonial troops on 24 October 1916, when the Germans withdrew from the position and there was no major fighting on or within the fort itself. The preliminary bombardment for this attack consisted of nearly 4,000 shells of large caliber, including three hundred 370-millimeter shells and one hundred 400-millimeter shells, fired from rail guns. After the preliminary bombardment the shell fire had almost obliterated the external workings of the fort, turning the Douaumont area into a moonscape. To give some idea of the intensity of the shelling, during the period from September 1914 to November 1917, Fort Douaumont was struck by more than 120,000 shells of all calibers. Of this number, more than 2,000 were shells larger than 270-millimeter. It is estimated that more than 100,000 French soldiers fell in the attempts to recapture Fort Douaumont. Hitler was convinced that the combination of the glider and

hollow charge was unbeatable and "took a really boyish interest in such escapades, particularly in the sudden attack on the Belgian Fort Eben Emael."[2] Within forty-eight hours of Student's meeting with Hitler, the attack order for neutralizing Fort Eben Emael was issued and given the code name Granite.

It became apparent to the mission planners that a specially equipped force was required to seize Fort Eben Emael, and both Hitler and General Student quickly realized that airborne forces were not the answer. Why not airborne? First, the JU-52 transport aircraft could only hold twelve parachutists, who were armed only with light weapons and possessed a limited demolition capability. Also, a typical parachute drop would last three minutes per aircraft and spread the jumpers over a 300 yard area. If additional equipment was required, it was dropped using a container system. Soldiers would then have to locate and retrieve their equipment before the mission could start, thus adding more time to the operation. Summarily, pinpoint accuracy would be required for landing on top of the fort and getting the troops with the necessary equipment to neutralize the cupolas, casements, and blocks before the Belgian defenders could destroy the bridges and that accuracy could not be achieved with airborne forces. In contrast, the DFS 230 glider, carrying ten men and a sizeable equipment load weighing no more than 4,608 pounds, could land within sixty feet of a target silently.

The DFS-230 glider was designed in 1933 by Dr. Alexander Lippisch to carry meteorological equipment. In 1936, the Luftwaffe soon saw its potential and had the Deutsches Forschungsinstitut für Segelflugzeug (DFS) aircraft company, under the Gotha Wagen Factory constructed three prototypes. Lead engineer Hans Jacobs and the German military worked in close cooperation and extensively tested the three prototypes and by

1939, the DFS 230 was in full production and in operational use by the German 7th Airborne Division. The DFS 230 assault glider has a wingspan of roughly seventy feet, is forty feet long and is normally towed by a JU 52 at 130 miles per hour.

On 2 November 1939, General Student selected Hauptman S. A. Koch, a talented officer well respected for his incredible ideas and tactics, and his 1st Company of Flieger-Jaeger Regiment 1 of the 7th Airborne Division for the mission. After renaming the unit Sturmabteilung Koch, it was moved to Hildesheim and mission training began. Prior to joining the 7th Airborne Division, soldiers would have undergone an eight-week training program which instilled in each of them the "Spirit of Airborne." Airborne soldiers who completed this training were expected to display exceptional levels of physical and mental stamina. The final result of this program was a cohesive, confident, and motivated body of volunteer men. Though recruits came primarily from the Hitler Youth, many volunteers for the division were taken from the recruit depots. The eight-week parachute training program was divided into two blocks of four weeks. The first block focused on fundamental combat skills and physical fitness, with eighteen-mile forced marches being common character development tools. During block two, troops were taught airborne and parachute techniques. Instruction during block two went from learning to pack a parachute to completing six successful static line jumps. In comparison to today's airborne operations where parachute jumps occur at 800 feet with a reserve, German parachutists at that time jumped from 400 feet with no reserves.

Hauptman Koch, after completing his mission analysis, knew he had four critical tasks in order for Operation Granite to succeed and facilitate the passage of General Fedor von Bock's Army Group B and the 4th Panzer Division: Sturmabteilung Koch

must seize and prevent the destruction of Veldwezelt, Vroenhoven, and Canne bridges and silence the artillery positions at Fort Eben Emael. He therefore divided his forces into four assault elements. Each assault element's objective was named for the primary building material used in each structure's construction. The bridges at Veldwezelt, Vroenhoven, and Cannes were named respectively Objectives Steel, Concrete, and Iron. The fort itself was named Objective Granite.

Oberleutnant Altman, with roughly ninety soldiers and ten gliders, would seize the bridge at Veldwezelt or objective Steel. The operation to seize the bridge at Vroenhoven, or objective Concrete, was the target of Oberleutnant Schacht and his assault team comprised of one hundred soldiers and eleven gliders. Hauptman Koch chose to command and control the operation near this bridge because of its central location and its solid construction. Objective Iron, the operation to seize the bridge at Canne, was commanded by Leutnant Schaechter and composed of eighty men in nine gliders. Oberleutnant Kiess was responsible for training the pilots and maintaining the gliders. The task of silencing Fort Eben Emael, Objective Granite, was given to Oberleutnant Rudolf Witzig and his eighty-six-man engineer platoon.

Oberleutnant Witzig was born on 14 August 1916 and at the age of twenty-four was placed in charge of the engineer platoon. He was known for being a strict disciplinarian, a meticulous planner, and believed realistic training was the only way to rehearse for an operation. Witzig's greatest strength was "his regard for the enlisted man and his squad leaders, giving them the necessary freedom and responsibility for their own plans."[3]

In the assault, Oberleutnant Witzig identified three necessary tasks and prioritized them as: first, destroy the weapons on top of the fort that could impede the landing of the gliders and movement on top of the fort; second, silence the gun batteries that were oriented toward the three bridges; and third, destroy entrance and exit points of the fort, thus preventing a garrison counterattack. Witzig also recognized that speed and shock were critical components of the mission's success and that he would only have one hour before a Belgian counterattack overwhelmed his platoon. Knowing that time was of the essence, a Luftwaffe liaison officer, Leutnant Delica, was assigned to the platoon. Delica was a forward air controller and communications officer with the responsibility of calling in bombers, fighters, and the planned resupply drop to assist in defeating Belgian garrison counterattacks. The plan also contained a linkup with lead elements of the 4th Panzer Division after it crossed the Albert Canal. The 51st Engineer Battalion, part of the 151st Infantry Regiment Group, would cross at the Canne Bridge and, if necessary, conduct a relief and support the silencing of Fort Eben Emael.

Witzig divided his platoon into eleven sections, one per glider, and gave each the task of destroying two emplacements and taking over another section's mission if necessary (table1 and figure 3). Each section contained seven to eight men with a complement of weapons ranging from a machine gun to a flamethrower. The entire assault force carried twenty-eight 50-kilogram and twenty-eight 12.5-kilogram hollow charges and numerous explosives totaling two-and-one-half tons.

Table 1. Assignment of German Objectives

Glider #	Squad Leader	Belgian Name Primary Objective	Belgian Name Secondary Objective
1	Feldwebel Niedermeier	Maastricht 2	Maastricht 1
2	Feldwebel Maier	Cupola 120	Antiaircraft Battery Vise 1
3	Feldwebel Arndt	Maastricht 1	Maastricht 2
4	Oberfeldwebel Wenzel	Mi Nord	Mi Sud
5	Feldwebel Haugh	Antiaircraft Battery	Cupola Nord Block 4
6	Feldwebel Harlos	False cupola 1	False cupola 2
7	Feldwebel Heinemann	False cupola 2	False cupola 1
8	Feldwebel Unger	Wooden barracks	Cupola Nord
9	Feldwebel Neuhaus	Mi Sud	Mi Nord
10	Feldwebel Hübel	Reserve	Reserve
11	Feldwebel Schwarz	Reserve	Cupola 120

The principles of a hollow charge were conceived in 1888 by Charles Munroe (1849-1938), who was considered one of the world's authorities on explosives, during his experiments on blowing up safes. The hollow charge works by allowing a conventional explosion to create a jet of high pressure immediately on detonation. This generates a tremendous penetrating capability using a relatively small charge. “The pressure created by the explosion would generally blow a one foot hole in the objective and kill everyone inside.”[4] Once ignited, the force of the explosion melted its steel liner and sent a molten metal stream of hot gases and metal splinters through a narrow hole into the casement. The large 50-kilogram charge, capable of penetrating up to ten inches, was divided into two spheres and required assembly prior to employment. The single sphere 12.5-kilogram charge was capable of penetrating up to six inches.

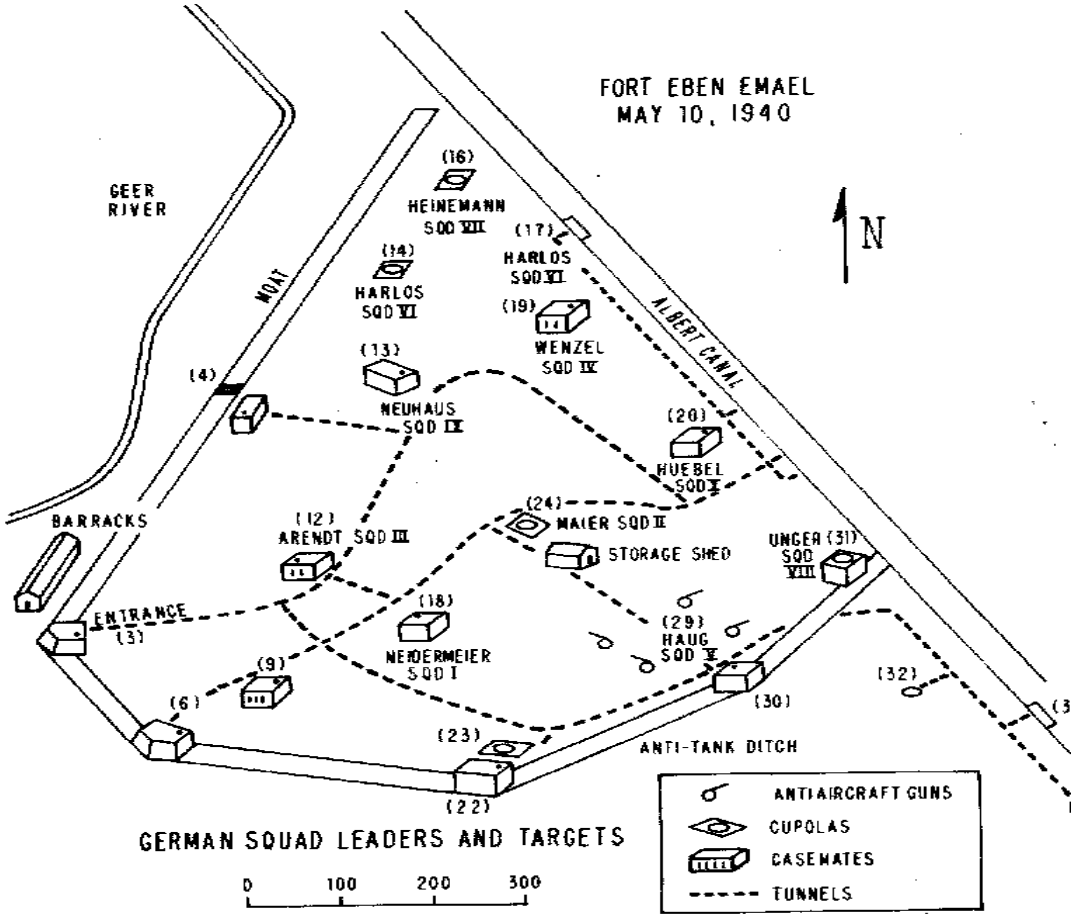

Figure 3. Placement of German Squad Leaders and Their Objectives

Source: William H. McRaven, Spec Ops Case Studies in Special Operations Warfare: Theory and Practice (Novato, CA: Presido Press, 1995), 35.

For the next six months, Sturmabteilung Koch trained in seclusion. Oberleutnant Witzig studied every detail during the planning and left nothing unaddressed. During glider insertion training, he determined the gliders could not effectively land on top of the fort as there simply was not enough room. Hauptman Koch worked with DFS and a hand brake was added, albeit a plywood frame that dug into the ground on landing. Pilots continued to train and by March 1940 were able to take off at night in small two to three

glider formations and land at unfamiliar airfields within fifteen-to-thirty feet of their target. Oberleutnant Witzig took glider training one step further and incorporated the pilots into the assault sections. They were soon capable of employing every weapon in the platoon. Scale rehearsal sites were set up using aerial photographs that replicated size and distances between targets. Platoon members were sent to demolition schools with the purpose of understanding how to destroy the artillery and antiaircraft equipment of the Belgian Army. They also studied how forts were built by conducting interviews with engineers and contractors. In February 1940 the platoon went to Czechoslovakia and later to Poland to train destroying casements and cupolas and seizing fortifications that once defended against a German attack. The famous Benes Line was a 300-mile line of fortifications that was equipped with the most advanced guns and equipment from famous Czech factories. Physical training was tactically focused on climbing and running with full gear, known today as "Battle Focused" training. By March 1940, Assault Force Granite had completed two full dress rehearsals that included glider takeoff and landings and attacking scale model objectives. During the entire six-month training period, only two aspects of the operation were not rehearsed: a full glider takeoff by the entire Sturmabteilung Koch and the use of the hollow charge. The hollow charge was so secret that Hitler did not want it compromised, as it was also being designed for use as a primer during German atomic bomb development. Oberleutnant Witzig was the only one to see it detonated before the mission. As May 1940 approached the men were anxiously awaiting the assault order, Code Name Danzig.

Operational security was the most critical component of mission success. It was imperative that the time and date of the attack were not known because a few well placed

machine guns on top of the fort could have pinned down the assault force. General Student said, “The whole premise behind the operation was that no leak in security could compromise the mission, and the only way for this mission to be successful was to achieve total surprise.”[5] From the time the order was issued, only five officers knew the exact location and name of Fort Eben Emael. Sturmabteilung Koch changed the units name every time it moved to new locations. Names varied from Airport Construction Platoon to Experimental Section Freidichshafen. The gliders were dismantled and moved around in furniture moving vans and concealed in locked and guarded hangers until a perimeter fence covered with straw mats was erected. Letters to families were censored by Oberleutnant Witzig, Hauptman Koch or Oberleutnant Kiess, and soldiers remained away from both civilian and military observation. Sergeant Helmut Wenzl, the senior enlisted man in Witzig’s platoon recalled, “We couldn’t go into bars but we could go to the movies. However, we had to have guards. Also, we didn’t wear insignia, and we had no names. Once we ran into some girls we knew [and] the whole unit had to be transferred.”[6] Each man in the company was also required to sign the following statement: “I am aware that I shall risk sentence of death should I, by intent or carelessness, make known to another person by spoken word or illustration anything concerning the base at which I am serving.”[7] Security was so serious that at one point two Luftwaffe soldiers curiously wandering around the hanger the day prior to the mission were arrested and sequestered until the operation was over. Two assault force members were seen talking to another unit near the hanger and were scheduled to be shot, however the assault order came and they were reprieved to take part in the attack.

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[1]Mrazek, 31.

[2]N-15860, *Statements of Generals of Former German Army* (Nuremberg, Germany: Combined Arms Research Library, 1 November 1947), 14.

[3]William H. McRaven, Spec Ops Case Studies in Special Operations Warfare: Theory and Practice (Novato, CA: Presido Press, 1995), 40.

[4]Ibid., 44.

[5]Christopher Ailsby, *Hitler's Sky Warriors German Paratroopers in Action, 1939-1945* (Dulles, Virginia: Brassey's, Inc., 2000), 37.

[6]McRaven, 37.

[7]Mrazek, 47.

CHAPTER 4

EXECUTION

Sturmabteilung Koch was alerted at 1930 hours on 9 May 1940 and proceeded to two airfields near Köln, Germany. “After six months of isolation, the alert in the afternoon of 09 May came as a relief.”[1] The gliders were scheduled to take off at 0430, 10 May 1940; this had been calculated in order to allow for all four objective groups to land simultaneously, at 0525, five minutes before the main German attack west. By 0450 all forty-two unmarked gliders were airborne and following a route marked with light beacons until they reached the Dutch border.[2]

Inside Fort Eben Emael, an alert warning was received from the Liège Headquarters at 0130, 10 May 1940. The report detailed German troop movements near the border; however, it caused no panic as it was the third alert that month and thought it was another training exercise. The fort’s commander, Major Jottrand, was sleeping in his villa when the report was received. He was awakened and informed of the situation. Major Jottrand immediately telephoned Liège for more information and directed Fort Eben Emael to execute the standing alert drill. The standing alert order called for gun crews to fire twenty blank rounds from the 75-millimeter gun at cupola 31 at one-half-minute intervals, thus alerting the canal bridge section of a pending attack and summoning the remaining gun crews that were garrisoned in the local area. At 0415, Lieutenant Longdoz, platoon leader responsible for surface antiaircraft and machine guns, reported that the majority of the soldiers were at their posts, including the troops who manned the surface mounted antiaircraft guns.

Twenty minutes later, Captain Hotermans, commander of the artillery battery, ordered Cupola Sud, which was the southern most set of 75-millimeter guns, to begin the blank fire barrage. At the same time, Major Jottrand heard gunfire from the direction of the nearby Dutch town of Maastricht and made up his mind that this was not a drill, but the real thing. The next step of the standing alert order called for the destruction of the barracks and administrative building just outside the fort's entrance to clear fields of fire. Since part of the fort's garrison was off duty, gun crews were used to carry out the mission to clear the front entrance; leaving only skeleton crews in some positions and leaving others entirely unmanned. At 0500, reports came in from both the Canne Bridge and the fort's top that unidentifiable aircraft were overhead, but no engines could be heard and the aircraft appeared to stop in mid air. After hearing these reports, Major Jottrand ordered the Canne Bridge blown. The bridges at Vroenhoven or Veldwezelt fell under the responsibility of Captain-Commandant Giedelo of the regiment stationed at Lanaeken, Belgium, and therefore were never given the order to be blown. As dawn approached, the Belgian defenders were able to recognize the aircraft as gliders. The Canne bridge crew reported that it had blown the bridge and under attack. The fort's antiaircraft gunners reported "airplanes with blocked engines" in site. The gun crews asked their commander what to do and he replied "shoot only if you can identify them as enemy." However, since the gliders were unmarked shot were not fired until they were within 200-300 meters.[3] One machine gun malfunctioned and the three others were only able to fire their starter belts of forty to fifty rounds before they malfunctioned. Fort Eben Emael had seven authorized antiaircraft guns, but only four were positioned on top. The

location of the remaining three remains a mystery. At 0525 10 May 1940 the first glider landed on top of Fort Eben Emael.

Soon after crossing the Rhine River, Oberleutnant Witzig's JU-52 towing aircraft went into a steep dive to avoid another plane. The dive caused the glider's tow rope to break. Knowing that they could not make it to the objective, he ordered the glider pilot to land in a nearby grassy field as close to Köln as possible. Witzig then ordered his crew to begin clearing fences and hedges in hopes of making a makeshift takeoff field while he made his way to a nearby village. Luckily, the village garrisoned an army unit that gave him a car to drive back to Köln. At 0505, Oberleutnant Witzig returned to the landing site with another JU-52 tow aircraft. With the engines still running, the crews quickly hooked up the glider and were back enroute to Fort Eben Emael.

Section 5, led by Feldwebel Haugh, encountered a different set of difficulties as it made its final approach toward their objective. It was hit with machine-gun fire, and glider pilot Lange said, "Our first target was the antiaircraft guns, if we were on the short final [and] they shoot in my direction and [then] it was easy for me to find my target because I could see the fire of the bullets if I looked over my shoulder, So I had to follow this direction."[4] The pilot maneuvered the glider toward the machine gun and as they landed and the glider's wing luckily caught the sandbag machine-gun emplacement. Upon landing, four Belgian defenders in the nearby wooden barracks woke up, stepped out of the building to investigate, and surrendered to the glider pilot Lange, who stood next to his cockpit pointing his pistol at them. The remainder of the Belgian defenders in the barracks fired a machine gun from the rear window toward Cupola Nord and Section 8. Hearing and seeing the guns from Cupola Sud firing on top of the fort, members of

section 5 placed two 50-kilogram hollow charges on its surface. The explosion of the hollow charges shook the Belgian crew and dislodged the gun mounts.[5] Though Belgian gunners continued to fire, their guns required time consuming adjustments after each salvo. Haugh noticed Feldwebel Unger's glider was in trouble near Cupola Nord, the easternmost pair of 75-millimeter guns. A troop was hit and lying on his glider's wing while heavy machine-gun fire pinned down the rest of his section. Haugh moved to help Unger and also came under fire. The two sections united and destroyed the machine gun position, though "It cost the squads heavily, two killed, one seriously wounded and several injured."[6] Fort Eben Emael came to life in her own defense. Artillery from the Cupola Sud, which Feldwebel Haugh thought he had destroyed, fired across the surface.

Feldwebel Neuhaus and Section 9's glider, shaken by Dutch antiaircraft fire near Maastricht, still managed to land within 150 feet of the objective. However, upon landing, the soldiers found themselves in barbed wire. The wire was quickly breached and a 12.5-kilogram hollow charge was placed on the machine-gun embrasure of Mi Sud, a machine-gun bunker located in the northwest of the fort. A 50-kilogram charge was then blown next to the neighboring machine-gun embrasure creating a space large enough for a person to enter. Feldwebel Neuhaus entered Mi-Sud only to find it abandon. The crew was ordered several hours earlier to assist in destroying the barracks and administrative buildings just outside the fort's entrance. Feldwebel Neuhaus' mission was complete and he immediately organized his men for defense and sent a runner to find Oberleutnant Witzig to report his progress.

Neutralizing Casement Mi Nord, the northernmost machine-gun bunker, was the responsibility of Oberfeldwebel Wenzel and Section 4. As their glider landed, Sergeants

Vossen and Bataille of Section 4 immediately opened fire. Wenzel, suffering a bloody nose during the landing, moved his men to the top of the casement and placed a 1-kilogram charge in the space which once housed a periscope.[7] When this did not silence the gun, Section 4 placed a 50-kilogram hollow charge on the steel cupola. The second charge exploded, but did not penetrate the armor plate of the cupola. Though it was not enough to accomplish the Section 4 objective, it was enough to cause the Belgian crew to abandon the position. Not satisfied with partial victory, Section 4 exploded another 50-kilogram hollow charge. This third charge was finally successful. When the debris stopped falling and the dust settled, Oberfeldwebel Wenzel stepped through the newly created hole and heard a telephone ringing. Lifting the receiver, he answered in the universal language of English "Here are the Germans" and the voice on the other end replied, "Mon Dieu!" (Oh my God!).[8] Within fifteen minutes, his section's mission accomplished, Wenzel ordered his men into defensive positions and waited for Oberleutnant Witzig to arrive at his position, which was designated as the platoon headquarters. Inside Fort Eben Emael, Major Jottrand ordered a general attack, a signal to shoot at any unidentified person and to be prepared to fire the artillery at a moment's notice. Sitting in his command post, he tried to figure out what was going on, tried to anticipate the Germans' next move. He could only wonder and wait for further information.

Feldwebel Unger and Section 8's glider flew a wide circle, trying to avoid antiaircraft fire, and came in low and fast from the south. The glider landed within sixty feet of Cupola Nord and immediately came under heavy machine gun fire from the north killing Feldwebel Unger and another German attacker. Oberfeldwebel Else took charge

and immediately sprang into action and emplaced a machine gun to provide covering fire for the assault. A 50-kilogram hollow charge was placed on the top of Cupola Nord and a 12.5-kilogram hollow charge against the steel entrance door. The charges exploded with no visible effects. Another 50-kilogram charge was placed on the door and not only blew the door off its hinges, but also caused the surrounding concrete to collapse, sealing the entrance.

Inside Cupola Nord, Sergeants Kip and Joris, the 75-millimeter gun crew, were in position by 0430 and reported seeing enemy activity. Sergeant Joris, Cupola Nord commander, realizing what was going on top of the fort, was in the process of carrying antipersonnel ammunition up the staircase when the first 50-kilogram hollow charge exploded.[9] Luckily for the Belgians, no one was in the turret. Oberfeldwebel Else seeing no visible effect from the hollow charge directs another 50-kilogram charge be placed near the steel exit door. The second explosion damaged the electrical equipment and rendered the cupola inoperative. With the mission complete, Obergefreiter Else took charge of Section 8 and moved to the platoon headquarters near Mi-Nord. At 0545, Major Jottrand ordered the tunnel sealed and Cupola Nord abandoned.

The pilot of glider 1 was forced to take evasive maneuvers when the glider came under heavy antiaircraft fire. The hard landing stunned Feldwebel Niedermeier and the men of Section 1. Recovering quickly, Section 1 performed its well rehearsed drill and placed a 50-kilogram hollow charge on Eben 3, the observation cupola on top of Maastricht 2, a southwest cupola containing three 75-millimeter guns. The explosion, the first on the fort, knocked Niedermeier and his comrade down and killed two Belgian defenders. A 12.5-kilogram hollow charge was placed on the on one of the 75-millimeter

guns. The blast hurled the 75-millimeter gun against the back wall, killing more Belgians and created a space large enough to enter the casement. Niedermeier and two others threw grenades into the newly created entrance and entered firing their weapons. They then dropped 3-kilogram charges down the staircase.

Artillery fire from Cupola Sud began to land on top of Fort Eben Emael near Maastricht 2 and Niedermeier ordered his men into the casement. He sent a runner to the platoon headquarters to inform Oberleutnant Witzig of their mission success. Inside the fort Sergeant Poncelet, chief of Maastricht 2 ordered the installation of emergency barriers after seeing three Belgians dead and seventeen wounded. The barriers would prevent the Germans from gaining access into the fort's tunnel system, and sealing the access door with sandbags and steel rods would prevent further German troops from entering the fort.

The last remaining objective that could destroy the bridges was Maastricht 1, the western most cupola containing three 75-millimeter guns. This objective was the responsibility of Section 3, under the command of Feldwebel Arent. The Section 3 glider pilot circled Fort Eben Emael twice before landing sixty feet from Maastricht 1. Arent and his section immediately sprang into action, but could not find a door or observation dome on which to affix a 50-kilogram hollow charge. They noticed the muzzles from the twin 75-millimeter guns and tried to attach the charge to them, but the guns were coated in preservation grease and the charges could not be attached. Feldwebel Arent finally attached a 12.5-kilogram charge to the ball joint at the base of the gun number 3. The charge exploded and black smoke poured out of a large hole. The gun had been torn from its hinges and blown back into the casement wall. Groans were heard inside the cupola as

the lights went out and the air smelled like burning propellant charges. Feldwebel Arent then dropped two hand grenades in the large opening and fired his machine pistol as he and two others entered the casement. Four heavily wounded Belgian defenders lay in shock. Artillery from Cupola Sud soon fell outside Maastricht 1 as Arent's squad sought cover within the protection of the casement. Noticing a staircase leading into the depth of the fort, Feldwebel Arent and two others went down the 118 steps only to find two massive steel doors blocking the entrance into the fort. He would make the trip down the staircase many hours later with a 50-kilogram charge in an attempt to penetrate the fort's interior. Modifying the eight second ignition, Feldwebel Arent exploded the charge killing six Belgian defenders and destroying the staircase to the surface. After seeing the locked steel doors, he and his men returned to the surface to find that the artillery from Cupola Sud had stopped and immediately attacked and neutralized Block 02 with a hollow charge. Section three remained between Maastricht 1 and Block 02 harassing in coming Belgian patrols and surprisingly using one of the 75-millimeter guns from the casement to fire onto those patrols.

Feldwebel Hübel and Section 10 were designated as the reserve. On landing without incident, a runner was sent to platoon headquarters to report the position. Oberfeldwebel Wenzel, now in charge since Oberleutnant Witzig could not be found, ordered the attack on Vise 1. Vise 1 was located in the northeast of the fort and had three 75-millimeter guns oriented toward the south. Within five minutes, the observation cupola was blown and the guns ceased to operate. Feldwebel Heinemann, with Section 7, and Feldwebel Harlos, with Section 6, attacked false cupolas in the northern most portion of the fort and set up defensive positions oriented toward the Geer River in the west. In

the first thirty minutes of the attack, all antiaircraft guns and surface mounted machine guns were destroyed. Mi Nord, Mi Sud, Vise 1 and Cupola Nord were neutralized. Cupola Sud was damaged and, though firing was doing so at a reduced capacity. The German attackers had freedom of movement on top of the fort.

Oberfeldwebel Wenzel noticed the 120-millimeter guns at Cupola 120, in the center of the fort, had not been attacked. Neutralizing Cupola 120 was the responsibility of Feldwebel Maier and Section 2, which could not be located. Inside the position, Sergeant Cremers, casement commander, saw the gliders land and at 0530 ordered gunners to attack the Germans. When the Belgians tried to operate the gun's ammunition hoist and rammers they noticed that electric power was not available. The crew frantically tried to fix the problem. Heiner Lange, the glider pilot from Section 5, was escorting prisoners to platoon headquarters, and as he walked past the cupola the 120-millimeter guns swung around toward him. Shells then landed from Cupola Sud and wounded him in eight places. Lange ordered the prisoners to lie down as he retrieved a 50- kilogram hollow charge from his glider. He placed the charge on the cupola, lit the fuse, and ran. The explosion caused no visible effect on the turret. A soldier from Section 5, Grechza, came over to investigate. The night prior, he had filled his water bottle with rum and by that time was drunk. Grechza climbed on the 120-millimeter guns and straddled them as the Belgians swung them in a circle. Oberfeldwebel Wenzel appeared and set a 3-kilogram charge in each barrel. The explosion shattered the gunners inside and put the casement out of action. Two hours later, Sergeant Cremers returned and ordered the gun to resume firing. The first round split one barrel open and filled the

casement with smoke. The gun with the split barrel was rendered unsafe to fire. The casement was never fired from again.

Section 2, which was unaccounted for at Fort Eben Emael, had been released too early by its tow pilot and landed in Düren, Germany. Commandeering a passing motorcycle, Feldwebel Maier found a nearby engineer unit and borrowed two staff cars. The section piled into the cars and set off for Fort Eben Emael. Driving through columns of vehicles they finally arrived at Canne only to discover the bridge had been blown. Feldwebel Maier was mortally wounded trying to cross the bridge. Meir, the second in command, made it over and stole a bicycle and rode toward the fort. Evading both German and Belgian attackers, he made it to the fort. Fearing no one would believe his story, he grabbed a copy of Fort Eben Emael's daily orders and linked up with Feldwebel Haugh. Then he went back to Canne to meet his section and lead them forward. He never found his section, but ended up escorting 110 Belgian prisoners he captured in the vicinity of Canne to Bergen.

At 0730 sixty-two Germans were on top of Fort Eben Emael for nearly two hours. Two soldiers were dead, eight severely wounded, and four slightly wounded. Oberleutnant Witzig and Feldwebel Maier's Section 2 were still missing. All antiaircraft guns and surface mounted machine guns were destroyed. Mi Nord, Mi Sud, Vise 1, Maastricht 1, Maastricht 2, Cupola 120, and Cupola Nord were neutralized. Cupola Sud was still firing at a reduced capacity and the blockhouses around the fort's perimeter were inactive.[10] Leutnant Delica, who had been working Stuka dive bomber missions within forty-five minutes of landing, and also directed in two aircraft for resupply of much needed ammunition and water. Oberfeldwebel Wenzel was in charge and talking to

Hauptman Koch relaying the status of ongoing operations. Suddenly at 0830, a lone glider appeared and landed near the platoon headquarters. Oberleutnant Witzig and Feldwebel Schwarz's reserve Section 11 stepped out of the glider. The platoon had one more hour at the fort until the 4th Panzer Division was scheduled to arrive to relieve them.

Thereafter, if the fort had not yet surrendered, the task would fall to the division. The main task of the platoon now was to keep the Belgian defenders in the fort and to prevent them from recapturing the surface. Sturmabteilung Koch had successfully seized the bridges over Veldwezelt and Vroenhoven intact, but the Canne Bridge had been destroyed.

After an initial update briefing by Oberfeldwebel Wenzel, Oberleutnant Witzig gave the order "to blow in the fortified entrances and press the attack into the depths of the fortress, holding all captured positions until relief arrived."[11] Major Jottrand, still shaken by the explosions and casement damage, realized that only a few Germans were attacking the fort and ordered a counterattack to clear the top. A group of fourteen men under Lieutenant DeSloovere emerged from the woods in the northwest corner and immediately came under attack from Feldwebel Arndt. The Belgians quickly retreated. By 1030 Major Jottrand became furious and launched two additional counter attacks in an attempt to dislodge the Germans from the top of the fort. Both counterattacks met with failure due largely in part to their "lack of infantry weapons (grenades, assault rifles, and machine guns) and infantry tactics (all the Belgians were artilleryman)."[12] Major Jottrand began to fear a German penetration into Fort Eben Emael and ordered the all tunnels blocked. He also called for additional artillery fire from the neighboring forts of

Pontisse and Barchon to target the top of Fort Eben Emael. In addition to these measures, he called his reserve force from the nearby town of Wonck. Lieutenant Levaque, in charge of the reserve force, left at 1345 with 233 men and immediately came under heavy fire from JU- 87 Stuka's. The constant dive bombing disrupted the reserve force's movement formations by scattering them throughout country side. By 1600, only fifteen of the 233 men had reached the fort and within the next few hours roughly half of the original reserve was postured for the counterattack. As darkness fell the Belgians found themselves under constant German machine gun fire, and only eight men stayed with the assault. By 1845 they were all within the safety of the fort's walls.

Early in the afternoon, Oberleutnant Witzig saw lead elements of the German 151st Infantry Regiment trying to cross the Albert Canal in rubber boats near Blockhouse 17. Blockhouse 17 was built into the side of the mountain facing the Albert Canal and contained two 60-millimeter anti-armor cannons, machine guns, and search lights. Feldwebel Harlos was charged with the destruction of Blockhouse 17, but had a challenge since the blockhouse was 120 feet below the top of the fort. He tied three 50-kilogram charges together, lowered them by rope on top of the blockhouse, and blew them with no visible effect. The gun crews in the blockhouse continued to fire until the next morning when lead elements of the 51st Engineer Battalion destroyed it.

As darkness fell on Oberleutnant Witzig's platoon, the men lay exhausted in a defensive position near Witzig's glider. The Germans set off demolition charges in the shafts of Maastricht 1, Mi Nord and Mi Sud. At 2030, Major Jottrand issued a defensive order for Fort Eben Emael. Throughout the night, incoming artillery fire and explosions kept the Belgian defenders in a state of fear. The interior of the fort was in shambles. The

constant explosions cut off the power to the majority of the fort and the lack of ventilation and heat began to make work conditions unbearable in the underground fort. Smoke permeated every corner, reminding the defenders of their German adversaries above ground and threatening asphyxiation if the situation did not improve. At 0830, 11 May 1940 Oberleutnant Witzig was officially relieved by members of the 151st Infantry Regiment. He buried his six dead and departed Fort Eben Emael.

At 1000, Major Jottrand received a message from Liège that help would not come. General De Krahe, commander of the Belgian III Army Corps, sent this message, "If the evacuation of the garrison is impossible, you are ordered to blow up the fort and all its men."[13] Jottrand summoned his senior leaders and explained the situation as he knew it. Then he read Article 51 of the "Instruction on the Defense of a Fort:"

> The surrender of a fort is not justified unless it finds itself in one of the two following circumstances:
> 1. When all defensive means of the fort and of its personnel are useless and non-reparable.
> 2. When all means of subsistence of the garrison are exhausted."[14]

In unison, the assembled council favored surrender and agreed to the terms which they would present to the Germans. The council would surrender on the conditions that the wounded be allowed to be evacuated, the garrison be allowed to live, and the garrison be treated honorably in accordance with the international agreements on prisoners of war. At 1227 11 May 1940, Fort Eben Emael was officially surrendered to Colonel Melzer, commander of the 151st Infantry Regiment. A German colonel approached the assembled council of leaders and said, "I congratulate you on your courage. Someone must be defeated in war. I am sorry this must happen to you. But this is war. I must send you to Germany."[15] The Belgian prisoners of Fort Eben Emael were kept in isolation until July

to keep the use of gliders and hollow charges a secret. They were then transferred to a prisoner of war camp in Fallingbostel, Germany and remained there for five long years.

The soldiers at Fort Eben Emael had held out for thirty-six hours, 700 men attacked by sixty-two. The Belgians lost twenty-three brave soldiers and had fifty-nine wounded. In comparison, Witzig's platoon suffered six killed and fifteen wounded. Several days after the platoon returned to its barracks in Hildesheim, it was ordered to report to a special ceremony. There Adolf Hitler addressed the men and presented each officer with a Ritterkreuz (Knight's Cross), Nazi Germany's highest combat decoration, and each soldier with an Iron Cross. Everyone involved was promoted one grade, except Grechza, the drunken soldier who straddled the 120-millimeter gun. Soon thereafter, the men received orders transferring them to other units and within a few months the platoon was deactivated. The platoon remained deactivated until early in 1941, when Hitler ordered an attack on the Greek island of Crete and the men of Sturmabteilung Koch were in demand again.

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[1]Rudolf Witzig, "Coup from the Air: the capture of Fort Eben Emael," *History of the Second World War Magazine*, 1966, 109.

[2]Due to the Operational Security requirements, all markings were removed from the aircraft during the training phase. Markings include black crosses and swastikas.

[3]J. A. Fievez, interview by author, 18 February, 2004, Maastricht, The Netherlands.

[4]Ibid.

[5]Since Cupola Sud was never and objective for the platoon, it is difficult to determine which section attacked it. Evidence shows that two 50kg hollow charges were detonated on its surface and the author deduced that section 5 was the nearest and most capable unit to accomplish this.

[6]Mrazek, 103.

[7]The periscope was removed for cleaning.

[8]Mrazek, 101.

[9]Cupola Nord's ammunition elevator was damaged when a crew member loaded the shells backwards.

[10]In total, Cupola Sud fired between 2500 and 3000 shells.

[11]Witzig, 109.

[12]McRaven, 53.

[13]Mrazek, 169.

[14]Ibid., 169

[15]Ibid, 180.

CHAPTER 5

ANALYSIS AND CONCLUSIONS

Germany had clearly linked political attitudes, priorities, and constraints that exerted a dominating influence on the development of the country's armed forces and strategic doctrine. The show of political and military might came to a climax on 10 May 1940 when Germany invaded France through the Low Countries and in a matter of weeks caused the surrender of France and departure of Britain, whose army fled the continent at Dunkirk. Not until June 1944 would Allied soldiers regain French soil. The plan to seize Fort Eben Emael was a plan which incorporated the technological possibilities of the hollow charge and the use of gliders for vertical envelopment. Technological factors can never be ignored when analyzing a military operation, but this instance offers a classic example of how technology's significance can be exaggerated to obscure the real reasons for a mission's success. Technology is one factor that contributes to victory and in this case it has received an inflated importance. Historians do not adequately address the importance of morale, leadership, planning, and esprit de corps of a unit to that unit's success. Quite simply, the seizure of Fort Eben Emael was "The best example in modern times of a well-defined plan thoroughly and flawlessly executed."[1]

Sun Tzu realized the importance of thoroughly studying the art of conflict and believed the only constant in war is change and change therefore is susceptible to rational analysis. Only those commanders who possess moral strength and intellectual faculty understand these changes and, after careful analysis, will strike only when the situation assures victory. The military genius of Hitler's decision to attack Fort Eben Emael using

the hollow charge and vertical envelopment is undeniable. General Student believed that "The capture of Fort Eben Emael is the greatest military victory that man has ever won."[2]

Neutralizing Fort Eben Emael was a shaping operation planned for the purpose of diverting the Allies' attention from the main attack the Germans planned through the Ardennes. In order for the plan to work, two German corps would have to penetrate Belgium, and Supreme Commander of French Land Forces General Gamelin would have to respond by initiating the Dyle Plan. A successful mission would include crossing the Albert Canal through use of the three bridges at Canne, Veldwezelt, and Vroenhoven. Standing guard over these key elements of the mission was Fort Eben Emael. Speed was critical to the German plan because if Fort Eben Emael was not silenced quickly, the Belgians would have the opportunity to fire on and destroy the three bridges. Had the bridges been destroyed, the Allied forces would have been able to reposition against the German main effort going through the Ardennes.

The French command reacted cautiously to the reports of a German invasion and it was not until 0700 on 10 May 1940 that General Gamelin initiated the Dyle Plan. Allied troops began to move to their designated positions of defense as required by the plan, but the entry of Allied troops into Belgium had not been coordinated in detail. Belgium's desire to remain neutral had hampered planning efforts and the lack of coordination between armies caused significant delays at the border crossing, where Belgian guards requested entry permits of Allied soldiers. In spite of problems like these, Gamelin continued to think the Dyle Plan would counter the German attack. Gamelin's superiors apparently did not agree. On 20 May 1940 General Maxime Weygand replaced General Gamelin as Supreme Commander of French Land Forces. The Dyle Plan did not

work and General Weygand found he had entered a grave situation. The Germans and Allies continued to battle until an armistice was signed on 22 June 1940.

The operation to neutralize Fort Eben Emael, like every military operation, began with a design that would guide the conduct of planning, preparation, and execution. "Commanders use the factors of METT-TC, elements of operational design, staff estimates, input from other commanders, and their experiences and judgment to develop their vision."[3] The United States Army Field Manual 3-0, Operations, outlines eight elements of operational design that provide a conceptual linkage of ends, ways, and means that help commanders visualize the operation and shape their intent. Though this was a tactical battle, it is important to understand Oberleutnant Witzig's application of certain elements of operational design in visualizing his battlespace.

Oberleutnant Witzig was successful in remaining focused on the desired end state of his operation. "The end state is the condition that, when achieved, accomplishes the mission."[4] Witzig knew that the purpose of his operation was to silence only those guns at Fort Eben Emael that could directly influence the crossing of the three bridges along the Albert Canal. Therefore his plan only accounted for those structures that would affect mission accomplishment; the entrance, Blockhouse IV, Vise 2, and Canal Sud were never objectives. Witzig had also ensured that his subordinates clearly understood the operation's desired end state. When Witzig did not arrive at Fort Eben Emael with the initial assault, Wenzl took charge of the mission with little disruption in ongoing operations.

During planning, Witzig had to consider not only his final objective, but also those centers of gravity which affected the successful completion of his mission.

"Centers of gravity are those characteristics, capabilities, or localities from which a military force derives its freedom of action, physical strength, or will to fight. Destruction or neutralization of the enemy center of gravity is the most direct path to victory."[5] Strategically, crossing the Albert Canal in the shortest possible time was the center of gravity for the OKH and the success of Plan Yellow. Tactically, Oberleutnant Witzig concluded that his center of gravity was his ability to move freely on top of the fort. An unrealized secondary effect of the hollow charge was its ability to cause concussive blasts within the fort. This unintended consequence was critical in breaking the Belgians will to fight.

Moving freely on top of the fort was Oberleutnant Witzig's center of gravity, and his decisive point to reaching that center of gravity was the destruction of those weapons that could impede his movement across the top of the fort. Decisive points are ways that commanders determine objectives that are clearly defined, decisive, and attainable. "A decisive point or objective is a geographic place, specific key event, or enabling system that allows commanders to gain a marked advantage over an enemy and greatly influence the outcome of an attack. Decisive points are not centers of gravity; they are keys to attacking or protecting them."[6] Strategically, the neutralization of Fort Eben Emael was a decisive objective for the OKH deception plan. Hitler recognized that using a direct approach would be costly and futile. Therefore, the necessity for an indirect approach became apparent. It was necessary to destroy the weapons providing defense for the fort as well as to destroy the entrance and exit points of the fort, thus preventing a garrison counterattack.

Lines of operation focus on the directional orientation of a force in relation to its enemy. They connect a force from its base of operation to its objectives. “In geographic terms, lines of operations connect a series of decisive points that lead to control of the objective or defeat of the enemy force.”[7] Though relevant in this case, the tactical operation to neutralize Fort Eben Emael does not fit neatly into this element of operational design. Army Group B, which was commanded by General Fedor von Bock, had multiple lines of operation concerning the mission, including the three bridges over the Albert Canal. At the tactical level, Oberleutnant Witzig had no lines of operation because his mission took place entirely at the objective.

Another element of operational design is the culminating point. FM 3-0 defines the culminating point in the offense as “A point in time and space where the attacker’s effective combat power no longer exceeds the defender’s or the attacker’s momentum is no longer sustainable, or both.” Throughout the planning of this operation Oberleutnant Witzig realized that it would be difficult to maintain a prolonged action. Though the original plan contained a link-up with lead elements of the 4th Panzer Division within four hours of crossing the Albert Canal, Witzig’s men, under the guidance of Oberfeldwebel Wenzl, dug defensive positions to repel a Belgian counterattack. Leutnant Delica, the Luftwaffe liaison officer, further reduced the risk of culmination by calling in Stuka close air support against Belgian defenders and by directing the resupply of ammunition and water by air.

The military offense is the decisive form of war aimed at destroying or defeating an enemy and is characterized by surprise, concentration, tempo, and audacity. “Commanders achieve surprise by attacking the enemy at a time or place he does not

expect or in a manner for which he is unprepared."[8] The operation at Fort Eben Emael is a model example of surprise and boldness directly attributing to mission success. There is no doubt that the Belgians were surprised by the vertical envelopment, but as the gliders landed they did encounter gunfire from the fort. This demonstrated a Belgian plan for the defense of the top of the fort, though an ineffective one that relied too heavily on the fort's supposedly impenetrable walls. "To the Belgian defenders, the gliders and German attackers presented an insignificant threat provided that the Belgians could retreat into the safety of the hardened fortress."[9] The real surprise for the Belgians came in the form of the hollow charge and how quickly the charges neutralized the defensive capabilities of the casements and cupolas. Through surprise, the German platoon was able to diminish the Belgian relative combat power and exploit its hesitancy to respond to the attack and their paralysis as they contemplated the possibility the fort was not impenetrable.

Concentration, or the massing of effects to achieve a single purpose, requires a commander to apportion his troops in such a way as to ensure a balance between the concentration of sufficient effects to successfully complete a mission and the need to disperse those effects in order to avoid them becoming a lucrative target for the enemy. Oberleutnant Witzig achieved concentration by giving each glider a primary and secondary objective and by identifying three necessary tasks and prioritizing them as first, destroy the weapons on top of the fort that could impede the landing of the gliders and movement on top of the fort; second, silence the gun batteries that were oriented toward the three bridges; and third, destroy the entrance and exit points of the fort, thus preventing a garrison counterattack.

"At the tactical level, a faster tempo allows attackers to quickly penetrate barriers and defenses and destroy enemy forces in depth before they can react."[10] Within two hours of the first glider touchdown at the fort, all antiaircraft guns and surface mounted machine guns were destroyed. Mi Nord, Mi Sud, Vise 1, Maastricht 1, Maastricht 2, Cupola 120, and Cupola Nord were neutralized. Cupola Sud was still firing at a reduced capacity and the blockhouses around the fort's perimeter were inactive. The Germans controlled the tempo of the battle by not allowing the Belgians time to recover from the initial shock of the attack. Constant dive bombing by Stuka close air support disrupted the reserve force's movement formations by scattering them into the countryside. Constant explosions cut off power to the majority of the fort and the lack of ventilation and heat began to make work conditions unbearable in the underground fort. The bombing and explosions shook the Belgian defense and smoke permeated every corner of the fort, reminding the defenders of their German adversaries above ground and threatening asphyxiation if the situation did not improve.

The characteristic of the offense at which Oberleutnant Witzig's platoon particularly excelled was audacity. "Audacity is a simple plan of action, boldly executed and inspires soldiers to overcome adversity and danger."[11] One key component to audacity is that every soldier within the unit understands the purpose of the mission and, if required to do so, reacts appropriately with little or no supervision. The most telling example of Witzig's platoon's audacity occurred at the outset of the battle, when Witzig failed to arrive with the initial attack force, leaving Oberfeldwebel Wenzl to take charge of the assault.

A second key component to audacity is the sense of personal commitment that each soldier brings to the operation. Prior to boarding the gliders in Köln, Obergefreiter Alefs of glider seven said, "There was unyielding determination in each man's eyes. Those who are our friends are our strong, loyal friends; those who are our enemies will find us unyielding enemies. With this feeling we could search out the devil in hell! We didn't need all the explosives. We could take the Fort by grenades and rifles."[12] Feldwebel Arent demonstrated both key components of audacity when he seized the opportunity to enter Maastricht 1 to investigate voices he had heard inside. Arent first dropped a small 3-kilogram charge down the stairs. The charge blew and the voices were silenced. Feldwebel Arent went down the 118 steps to find a massive steel door blocking his entrance in the fort but no Belgian casualties in the stairwell. He climbed back up and prepared his men for a potential Belgian counterattack. In the case of the assault on Eben Emael, the Germans possessed audacity and purpose which the Belgians could not match.

The men of Oberleutnant Witzig's platoon also exemplified the will to win, or what we call today the warrior ethos: "The warrior ethos is the will to win with honor. Despite a thinking enemy, despite adverse conditions, you accomplish your mission."[13] Soldiers are not born with a warrior ethos; rather they emulate their leaders and gain confidence through training to established standards. The rigorous training of the 7th Airborne, coupled with the unflagging determination of Oberleutnant Witzig, created a unit which possessed an unshakable warrior ethos.

The role of emerging technology cannot be ignored in discussing the seizure of Fort Eben Emael; however, the contribution of the emerging technologies of the vertical envelopment and the hollow charge has been exaggerated in previous studies of the

operation. Major T. N. Mouat, an ammunition technical officer with the British Army, recently examined the effects of the hollow charge and concluded; “In only one case, out of fourteen gun positions, was it possible that the hollow charges achieved the destruction of the gun concerned.”[14] Three examples, detailed below, illustrate this point and further the conclusion that the hollow charge was only effective when wedged at an angle in an embrasure. However, angling the hollow charge in such a way defeated its design principle and rendered its use and effectiveness no different than that of a conventional demolition charge.

Wenzel’s Section 4 placed a 50-kilogram hollow charge on the steel cupola of Mi-Nord. The charge exploded, but did not penetrate the armor plate of the cupola. Though it was not enough to accomplish the Section 4 objective, it was enough to cause the Belgian crew to abandon the position. Not satisfied with partial victory, Section 4 exploded another 50-kilogram hollow charge in the embrasure. The third charge was finally successful and when the debris stopped falling and the dust settled, Oberfeldwebel Wenzel stepped through the newly created hole. See figure 4.

Figure 4. Photograph of Mi-Nord

Source: Jean Paul Pallud, *Blitzkrieg in the West* (Great Britain: Battle of Britain Prints International, Limited, 1991), 83.

Feldwebel Unger and Section 8 placed a 50-kilogram hollow charge on the top of observation Cupola Nord and a 12.5-kilogram hollow charge against the steel entrance door. The charges exploded with no visible effects (figure 5. Another 50-kilogram charge was placed on the door and not only blew the door off its hinges, but also caused the surrounding concrete to collapse, sealing the entrance. Heiner Lange exploded a 50 kilogram charge on the top of Cupola 120 with no visible effect on the turret (figure 6). The cupola was not silenced until Oberfeldwebel Wenzel appeared and exploded a 3-kilogram charge in each barrel.

Figure 5. Photograph of Observation Cupola Nord

Source: Jean Paul Pallud, *Blitzkrieg in the West* (Great Britain: Battle of Britain Prints International, Limited, 1991), 83.

Figure 6. Photograph of Cupola 120

To fully understand the effectiveness of the hollow charge to penetrate some structures while others remained intact, it is necessary to explore the principles of the hollow charge as discovered by Charles Munroe. The hollow charge uses a liner inside its cavity. The size and material used for this liner dictate the penetrating power of the charge's explosion. The mathematical ratio of liner to penetrating power is known as the Munroe Effect. In 1940, the Munroe effect was not yet fully understood. The hollow charge was far more effective than conventional explosives only when the thickness of the armor being affected was less than the cavity size in the charge. In the case of Fort Eben Emael, the armor plate of the gun cupolas had a greater thickness than the cavity liner of the hollow charge, but the observation cupolas did not. Figure 5 best illustrates the effects the hollow charge had on an observation cupola and in contrast to cupola 120 in figure 6.

The success of the operation to neutralize Fort Eben Emael is often attributed to the use of the hollow charge. This theory fails to take into account the aspect that the human dimension has on military operations. Western society finds comfort in rationalizing military success or failure through impersonal, technological explanations. A soldier knows that technology is but one factor of many to a mission's success and that it is not always a reliable factor. Politics and economics often determine which units receive the latest equipment. A leader who develops rigorous training plans, who adjusts the organization of units as needed, and who displays and encourages the warrior ethos in soldiers has much more effect on operational success than any emerging technology could ever have.

Germany possessed what were arguably the finest soldiers in the world at the time of the attack on Fort Eben Emael. Oberleutnant Witzig's men had spent six months undergoing a rigorous training program which had increased their physical fitness, trained them on the finest detail of their operation, and developed in them a firm esprit de corp. Witzig's platoon believed it was superior to its enemy. Its conviction was only strengthened by the realization that it fought forty-year-old conscripts, wearing World War I uniforms and using copies of German rifles from that war.

The Belgians lacked basic infantry training and lacked the physical and mental preparedness for war. To belittle the Belgians for their defeat would be unjust to those who fought in the catacombs of Fort Eben Emael. A further understanding of the dynamics of the fort and her defenders can be gained by the knowledge that that fort was regarded as a punishment post and treated as such. Major Jottrand did not have decisive command and control of the fort, or the ability to communicate with surrounding ground support units. He was required to request approval from Liege for assistance from those ground support units. In addition, Jottrand was plagued by a ten-percent desertion rate between each shift. In an effort to increase morale and decrease desertion rates, Jottrand authorized the construction of a soccer field on top of the fort. Use of the soccer field allowed his soldiers to take in the fresh air and natural light after duty hours. Soldiers typically worked 170 hours in the fort, the entire time breathing processed air and without access to any daylight. The soccer field did increase morale and the desertion rate declined; however, the field would provide a perfect landing zone for Oberleutnant Witzig's gliders. Belgium's declaration of neutrality in 1939 did nothing to help circumstances at the fort. France, which funded roughly eighty percent of the fort's

construction costs, stopped funding when Belgium declared neutrality. Major Jottrand was left with many projects that remained unfinished due to lack of funding. The most critical of these projects was the resources for the external defense. Even Witzig believed that the Belgian soldiers did the best they could with the leadership and resources available to them. He believed that if roles had been reversed, the outcome of the battle would have been the same. In his words, if anyone was to blame for the fall of Fort Eben Emael, it should have been the Belgian government. Though they defended the fort as best they could, immediately after the war the Belgian soldiers who defended Fort Eben Emael were put on trial for dereliction of duty. For more than ten years the Belgian government continued to look for someone other than itself to blame.

The success of the mission to neutralize Fort Eben Emael is most often credited to the emerging technologies of the hollow charge and glider. Though those technologies contributed to the completion of this German mission, they are not solely responsible for the outcome. The seizure of Fort Eben Emael illustrates that morale, leadership, planning, and esprit de corps are far more important to unit success than any technologies used by the Fallschirmjaeger and Fallschirmpioniere.

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[1]McRaven, 55.

[2]Mrazek, 188.

[3]Headquarters Department of the Army, Field Manual 3-0, *Operations* (Washington, DC: US Government Printing Office, 2001) 5-3.

[4]Ibid., 5-6.

[5]Ibid., 5-7.

[6]Ibid., 5-7.

[7]Ibid., 5-8

[8]Ibid., 7-4.

[9]McRaven, 66.

[10]Headquarters Department of the Army, Field Manual 3-0, *Operations* (Washington, DC: US Government Printing Office, 2001) 7-6.

[11]Ibid., 7-6.

[12]Mrazek, 65-66.

[13]Headquarters Department of the Army, Field Manual 22-11, *Army Leadership* (Washington, DC: US Government Printing Office, 2001) 4-1.

[14]Mout, 17.

GLOSSARY

Airborne units. Combat organizations that arrive on the battlefield during forced entry operations. Units may be comprised of airland, glider, parachute or any combination of the three.

BEF. British Expeditionary Force.

Blitzkrieg. War conducted with great speed and force; specifically**:** a violent surprise offensive by massed air forces and mechanized ground forces in close coordination.

DFS. Deutsches Forschungsanstalt fur Selgelflug. The three letter designator, followed by a number for German gliders utilized during World War II.

DFS 230. The DFS 230 were high-winged monoplane gliders with a steel-tube frame, fabric covered fuselage, and stressed plywood wings. Wheels were used for take-off and a centrally mounted skid for landing. The design load was one pilot and nine troops, with the troop seats removable to create cargo space.

DGDP. Directorate of Graduate Degree Programs.

Dyle Plan. The Dyle Plan (so named for the Dyle River which runs from Antwerp to Namur). The river, coupled with French planners' hopes of the Belgian border fortifications holding for five days, would allow French and British forces to assemble east of the Dyle Line and stop a German advance.

Esprit de corps. The common spirit existing in the members of a group and inspiring enthusiasm, devotion, and strong regard for the honor of the group.

Fallschirmjaeger. German paratrooper.

Fallschirmpioniere. German engineer paratrooper.

Field Manual (FM). A United States Army document that outlines approved doctrine, tactics, and techniques, and procedures for units in both training and combat.

Gembloux Gap. A 28 km stretch of rolling farmland between the Southern flank of the KW line and the Namur position that was not fortified.

Glider Forces. Combat units that are designated to fly in gliders during forced entry operations and are normally assigned to airborne units.

Hollow charge. The principles of a hollow charge were conceived in 1888 by Charles Munroe (1849-1938), who was considered one of the world's authorities on explosives, during his experiments on blowing up safes. The hollow charge works

by allowing a conventional explosion to create a jet of high pressure immediately on detonation.

JU. German airplanes built by the Junkers Factory. Numbers typically follow acronym to designate type of aircraft utilized during World War II by the Germans.

JU 52. The Ju 52 was an essential part of the Luftwaffe and it proved itself a versatile and reliable aircraft in almost six years of conflict. The Ju 52 first saw service as a civil airliner in the 1930s, but on the outbreak of war in 1939, it found a demanding role as the Luftwaffe's primary transport aircraft, deployed in the transportation of supplies and personnel and, on occasion, flying paratroopers to their target destination or towing the DFS 230 glider.

KG. Kilogram. 1 kilogram equals 2.2 pounds.

KW. Koningsooikt Wavre.

Maginot Line. Named after André Maginot, French minister of war: a line of defensive fortifications built before World War II to protect the eastern border of France but easily outflanked by German invaders.

MG 34. German machine gun.

METT-TC. United States Army acronym; Mission Enemy Terrain Troops Time and Civilian Considerations.

MM. -millimeter. 25 -millimeters equal 1 inch.

OKH. Oberkommando des Herres, German Army High Command.

Plan Yellow. German plan for invading France and the Low Countries. The plan called for Army Group A, under General Gerd von Rundstedt, to break through the Allied center and attack toward Abbeville, France with forty five divisions, including seven of the ten panzer divisions. Army Group B, commanded by General Fedor von Bock, would attack into Belgium and the Netherlands with 29 divisions including the remaining three panzers and draw the French and British to the Dyle Line which, in turn, protected Army Group A's flank. General Ewald von Kleist, commander of Army Group C, would attack the Maginot Line with nineteen divisions to prevent the French from repositioning forces against Army Group A.

APPENDIX A

U.S. AND GERMAN RANK EQUIVALENTS

U.S. Army	German Army
Captain	Hauptman
1st Lieutenant	Oberleutnant
2nd Lieutenant	Leutnant
Master Sergeant	Oberfeldwebel
Staff Sergeant	Feldwebel
Corporal	Obergefreiter

APPENDIX B

WHAT HAPPENED TO THE GERMAN SOLDIERS

Figure 7. Photograph of German Officers

Source: Jean Paul Pallud, *Blitzkrieg in the West* (Great Britain: Battle of Britain Prints International, Limited, 1991), 87.

Rudolf Witzig
(Second from left in photo)
Born - 14 August 1916
Died - 3 October 2001

Rudolf Witzig was born into a working class family on 14th August 1916, Westphalia, Germany. He joined the post war army at the age of 18 in April 1935. He was an officer candidate and by the beginning of 1938 had attained the rank of Leutnant.
By the start of the Second World War he had been promoted to Oberleutnant and was serving as the commander of the Fallschirm-Pioneer Kompanie of the 2nd Battalion, 1st Parachute Regiment. His company was amalgamated with the 1st Battalion, 1st Parachute

Regiment under the command of Hauptman Walter Koch for the assault on Eben Emael. The assault was a complete success and he was awarded the Knights Cross personally by Hitler for his exploits. In May 1941 he participated in the assault on Crete as a commander of company number 9 of the third parachute battalion. In May 1942 he was given command of the 7th Airborne Divisions Pioneer Battalion and in August of that year was promoted to Major. He next saw action in North Africa when he and his pioneers were airlifted into Tunis in November 1942 to help construct the defensive line around the city from the Allied advance. In December 1942, the 3rd Kompanie of the Pioneer Battalion was air dropped behind the British lines to disrupt supply lines by destroying airfields and bridges. In June 1944, as the Allies were pouring ashore in Normandy he was given command of the 21st Fallschirm-Pioneer Regiment and in July 1944 they were sent to Lithuania. They took up positions around the Dunaburg-Kovno road and awaited the Soviet advance. They took heavy casualties during this action but they succeeded in destroying many Russian tanks in the process and inflicting heavy casualties on the enemy infantry. They were forced to withdraw from their positions and were eventually returned to Germany in October 1944 to regroup.
Rudolf Witzig was then given command of the 18th Regiment, 6th Parachute Division stationed in Holland. On November 25th he was awarded the Oak leaves to his Knights Cross and his name was placed on the Luftwaffe honor roll. The 18th Regiment then saw heavy action in the Reichswald Forest between February and March against stronger British and Canadian forces. After the war he settled in Western Germany and studied civil engineering. In 1956, he joined the armed forces of the post war Bundeswehr where he rose to the rank of Colonel and commanded the German Army Engineer School until his retirement. Rudolf Witzig passed away on October 2001.

Walter Koch
(Third from left in photo)
Born - 10 September 1910
Died – 27 October 1943

Walter Koch was born in Bonn, Germany and left school in 1929 to join the *"Landespolizeigruppe Berlin"*. In September 1935, Koch was promoted to Oberleutnant and served with the famous "General Göring Regiment". On 20th April 1938, he was promoted to Hauptman and began training as a pilot. Koch was soon sent back to his company and was given a new order to form a Parachute Assault Company for the attack on Fort Eben Emael and the bridges over the Albert Canal. Hauptman Koch along with several other officers of his detachment were awarded the Knights Cross. Sturmabteilung Koch was renamed to the *Luftlande Sturmregiment* and expanded to four battalions. Now a Major, was given command of the 1st Battalion. In May 1941, the Sturmregiment was moved from its garrison towns in Germany to airfields in Greece in preparation for the invasion of Crete. Soon after landing, Major Koch received a serious head wound from enemy fire and was evacuated. After recuperating from his wound, Major Koch returned to 1st Battalion, Sturmregiment in November 1941 and in December 1941, the battalion was moved to Russia where it saw fighting near Leningrad. In February 1943, Koch

returned to Germany after suffering yet another head wound in the fighting in Tunisia. After hospital treatment and recuperation, Koch was transferred to the Luftwaffe Officer Reserve in August 1943 and in early October 1943, Walter Koch was traveling in a staff car when it careered off the road and crashed. After being seriously wounded in the crash, Koch was moved to hospital in Berlin, where he died on 27th October 1943.

Figure 8. Photograph of Oberfeldwebel Wenzl

Source: Jean-Yves Nasse, *Green Devils German Paratroopers 1939-45* (Paris, France: Histories & Collections, 1997), 27.

Helmut Wenzl
(Left in photo)
Born - 10 March 1913
Died - 24 January 2003

Helmut Wenzl was born in Kyschienen, Prussia and entered military service at the age of twenty. In 1937, he joined the *Fallschirm-Infanterie-Kompanie*. After the assault of Fort

Eben Emael in 1940, he participated in the invasion of Crete and was captured by Allied Forces in the North Africa campaign in 1943. After his capture, he was sent to the prisoner of war camp in Crossville, Tennessee. At the end of 1944, he returned to the European continent and searched for his wife, son, and relatives from Prussia and began his life as a forester in the *Lüenburger Heide* near Hanover, Germany. In 1965, he started a program to unite the German and Belgian soldiers of Fort Eben Emael in an attempt to heal the scars of war through friendship. Helmut passed away on 24 January 2003 in Celle, Germany.

The figure below depicts the disposition of Rudolf Witzig platoon as of the date of this thesis. It is remarkable that three are still alive today; however, it is unfortunate that thirty- four perished during the remainder of World War II.

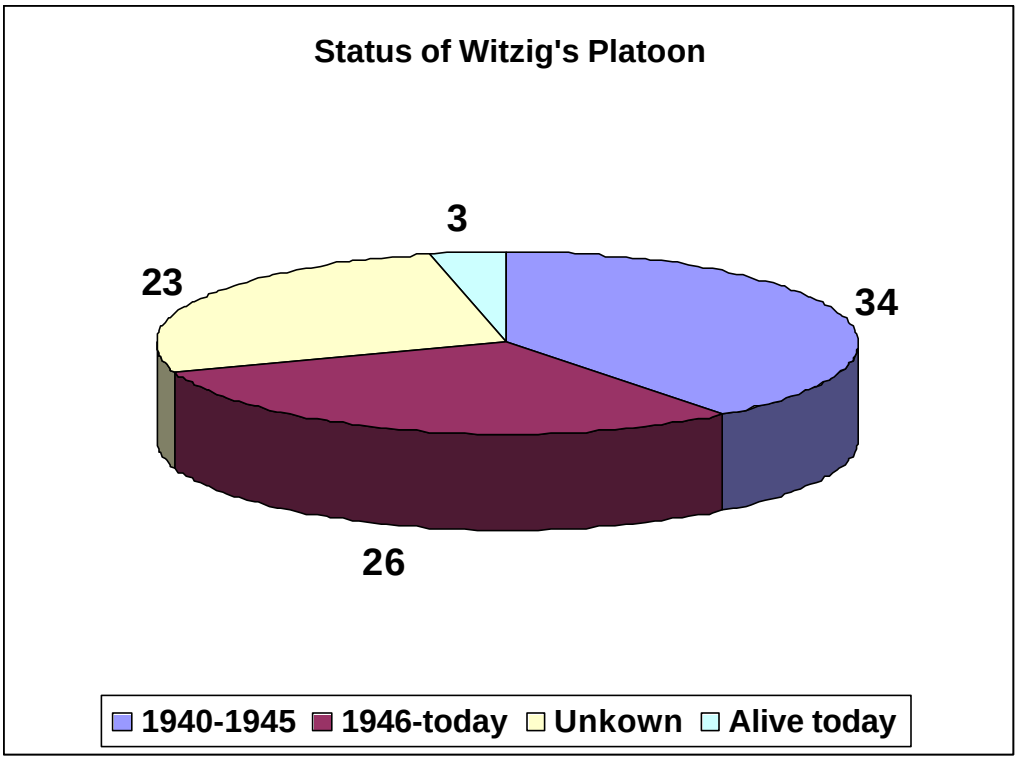

Figure 9. Status of Witzig's Platoon

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