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TECHNICAL MIRACLES: THE WEIRD WEAPONS OF THE SECOND WORLD WAR

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ABSTRACT

In wartime, nations are stretched to their absolute limits economically, technologically, physically, and morally; during these difficult times, arms development and research finds its boom times. It is only during these times that we see developments so outlandish, strange, and totally absurd receive legitimate attention from militaries seeking to address the complications created by their particular situation. It is only during wartime that “weird” weapons receive attention and funding from governments that would otherwise not have the need for such insane designs. This thesis will describe and analyze weapons designed before and during the Second World War. It will weigh the conventional designs of the interwar period with the increasingly odd designs that were produced during and, I will argue, as a result of the war. This thesis will analyze the impact of many of these creations and what they mean for weapons development in a historical context.

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Chapter 1

Introduction

Arms development during the wartime is an industry that generates untold profits generating designs for use in militaries currently engaged in mortal combat on a massive scale. During the Second World War, this industry saw its greatest period of expansion. Aircraft design, armored vehicles, infantry arms; all saw leaps and bounds developmentally. Innovations in conventional weapons designs were developed across all combatant nations. New and improved arms were required to address and overcome the problems that the ever changing nature of the war created. Those nations that could not adapt and overcome in this war of technology would be destroyed. Production and adaption were the bywords by which a war effort could crumble. Without effective production, mass production, a few new weapons had little effect on a war of millions. Without proper innovation, old designs, even mass produced, would swiftly be outpaced by the country that could improve its designs rapidly. The extreme stresses of the war would warp the nature research and development in the warring nations. With the outbreak of the World War, it became rapidly apparent that weapons design could come from anywhere and anyone. This global war presented lucrative opportunities anyone with a good enough idea for a bomb, or plane, or tank. The war also opened the door to some of the strangest, weirdest, most unconventional arms yet seen by the world.

This thesis will focus on these weapons; the weird, unconventional, quirky designs that received serious attention from the military establishments of the United States, Great Britain and Nazi Germany. Over the course of this paper, various weapons designs will be discussed,

their developments analyzed, and their “weirdness” assessed. The weapons that qualify as “weird” in this paper are those that were described by their creators or the public in such terms. While the term “weird” is hardly ever used, others like “astounding”, “miracle” “queer” “unconventional” and “odd” are used. Additionally, those weapons described in biblical or ridiculous ways are included in this thesis. The development and design of these weapons will be analyzed in particular in order to clarify what pushed them out of the conventional realm and into the unusual. This area in particular is currently ignored in the historiography of “secret weapons” literature; most current studies of such oddball programs assess the weapons performances or design capabilities. The literature focuses on what made these weapons either work or not work. This thesis will do this to some degree, but instead focus more energy in explaining how the armaments received attention and funding by their various governments.

The first chapter of this paper will examine the weapons designs researched during the period between the wars, specifically after the Nazis took power in 1933 until 1939. During this time period, Germany and the United States both underwent wildly different rearmament campaigns. In Germany, this meant creating weapons systems that would work within the *blitzkrieg* strategy that was developed during the same time. Central planning and government interference directed arms development at this time. For the most part, the arms built and tested at this time drew upon lessons from the Great War. In the United States, the interwar arms race was spearheaded by private individuals who sought lucrative government contracts. The various branches of the U.S. military meanwhile fought to find ways around the National Defense Act of 1920 with the projects that they pushed forward. With few exceptions, weapons that were developed and equipped armies during the interwar period were very conventional. This makes sense in countries like the U.S. where disarmament and isolationism were the bywords of the

day. Only weapons that had been seen before, that were well tested and known to work, received attention. In Germany, economic hardship helped to restrict arms development to a very rigid tactic developed in preparation for the next war: blitzkrieg. This tactic involved producing weapons capable of keeping up with a “lightning war” and combined with Germany’s economic restrictions, did not leave room for out of the ordinary creations. This chapter will set up the focal argument that the creation of strange arms is a phenomenon born of the horrors, stresses, and necessities of war.

The outbreak of the Second World War presented one of the greatest opportunities for weapons development in history. Both conventional arms and some of the weirdest weapons of the war were built during this period. The arms produced at this time, regardless of their scope, were often the result of arsenal short comings that were made apparent during the conflict. The goals and scope of these oddball arms depended very heavily on their countries of origin. For Great Britain, the weirdest projects tended to only receive approval if they addressed an issue in a practical and materially inexpensive manner. That did not stop engineers and scientists in that country from thinking big, but big explosive ideas rarely went past the testing phase. For the United States, the attack on Pearl Harbor brought the need for revenge against the Empire of Japan. In keeping with the interwar tradition of privately driven arms developments, the U.S.’s weirdest weapons were proposed to the military by tinkerers, inventors, and scientists: private individuals. Some of these designs were misguided attempts at vengeance, others the feverish designs of visionaries. Many of the forays into the weird for the U.S. at this time were utter flops. The Germans’ took the first few years of the war as an opportunity to further develop their jet program. This was in an effort to conserve fuel resources and was heavily influenced by Nazi bureaucracy. Central planning and influences from on high continued to dictate what was and

was not produced in Germany at this time and often created the opportunity for some very unconventional projects to flourish.

The war dragged on and the strategies of unconventional weapons development changed rapidly. As the war turned in the Allies' favor, German weapons development was dictated by revenge and desperation. The V-series of weapons, weapons of vengeance personally approved by Hitler, made their first appearances following the invasion of France in 1944. The British continued to work towards practical (if strange) solutions to the problems generated by fighting such a prolonged conflict. The United States during this stage of the war produced one of the weirdest and most world changing devices in history: the Atomic Bomb. On the whole, weird designs that were produced during this time were largely conventional ideas taken to the point of incredulity in a desperate attempt to end a campaign or win the war outright. Most of the weapons to come out of this time period were actually fielded, or nearly fielded before the war ended. The weapons of the end times all saw great improvements and further experimentation during the peace that followed.

The development of weird weapons across all three of these nations is marked by the involvement of powerful people, the stresses of war, and the individual colors of their designers. The individuals responsible for the most unconventional designs of the war are about as colorful as the weapons themselves. Personal connection seems to play the biggest role in what received attention, fame and renown as well. The individuals' or their departments' innovative ideas were often only approved if they managed to bend the ear of an important individual, all the while toeing the line between conventional and utter fantasy. These ideas did not come from thin air either; they were very much a product of the world war and the decisions to approve the weirdest of the arms seems to have only been possible during wartime. Wartime created an atmosphere

where there were no good or bad ideas, rather, ideas that will or will not get the job done. Weird and unconventional weapons were often the result of this necessity.

Chapter 2

Defining the Weird and the Context for the Development of Arms and Strategies during the Interwar Period (1919-1939)

This chapter will focus on a comparison of two of the nations that underwent parallel arms developments during the interwar period: the United States and Germany. Both countries demilitarized to a large degree following the close of the Great War, and both countries were struck very hard by the Great Depression and Crash of 1929. However, these countries differ wildly in the methods and timeframe for their rearmament. In Germany, later Nazi controlled Germany, rearmament was one of the tenants of Hitler's economic recovery plan.¹ To achieve this, the Reichministerium für Rüstung und Kriegsproduktion, the Reich's Ministry of Armament and War Production (RfRuK), was created to oversee the production of arms in state run or overseen industries in 1938. This Ministry was created as a part of the Organization Todt, and was headed by Dr. Fritz Todt.² For the German military, rearmament had begun much earlier than this, as will be discussed later. In contrast to the German example, arms development in the U.S.. was not undertaken until well into the late 1930s at the urging of General Douglas MacArthur and other experienced members of the War Department. From there, competitions were held for various War Department contracts. Technological developments that were applied to military production were often produced by members of the private sector. First, in keeping

¹ Hitler, Adolf. *Mein Kampf*. Boston: Houghton Mifflin 1939 Pg. 459, also Bennett, Edward, *German Rearmament and the West 1932 – 1933*. Princeton NJ, Princeton University Press, 1979, Pg. 319

² Speer, Albert. *Inside the Third Reich: Memoirs*. New York: Simon & Schuster Paperbacks, 1970. Pg. 108-109, and 180-183

with the thesis of this paper as a whole, we must discuss first the meaning of “weird” and how it applies to these two nation’s interwar developments.

Before beginning a discussion on the arms developments that were undertaken during the interwar period, we must first define what it means to be conventional and unconventional. These distinctions will be made using primary sources. Unconventional, strange, and “weird” weapons often received praise or condemnation using these terms. Such writings will be the primary evidence for what this paper defines as weird and differentiates from the conventional.

Conventional weapons are quite simply, - weapons with an existing developmental tree of previous iterations. For example, the rifle is built upon the rifled musket, which is in turn built upon the musket, the hand cannon, etc. In a much narrower sense, bolt action rifles which were used extensively during the Great War and thus were nothing new when war broke out in 1939. This often leads us to the conclusion that for a weapon to be conventional it must also be practical. This is not necessarily the case. The “weird” and “queer” and “unconventional” can also be quite practical solutions to problems. Case in point, weapons that were unconventional and “weird” during World War I, like the tank or the bomber, became standard arms for industrialized nations following the Armistice. The “weird” can therefore become conventional. These weapons, which may very well been secret weapons at the time (in between the wars), could still be conventional despite being under wraps. This thesis will focus on the primary sources that define weapons as odd or unconventional. Additionally, weapons that never left the drawing board will be examined for their strangeness; after all, many projects were cancelled by bureaucrats or generals who were wary to greenlight designs that had never been seen before. Tried and true creations on the other hand received the lion’s share of funding before the war.

Conventional weapons or projects are often as difficult, if not more difficult, to define as such convention rarely requires delineation. Things that are known, arms that are not new, or are simply updates of old designs are not usually accepted so readily that they are deemed “innovations” or “developments” before being called outstanding. Time is usually what softens new development’s rough edges of strangeness. Innovations, which may have been new during the postwar period, often spread so quickly that they had become commonplace in militaries by the start of the Second World War.³ Time is very much a factor in determining convention. A human being flying through the air was an entirely unheard of, alien idea before the Wright Brothers proved powered flight possible. Ten years later, biplanes were used against miners fighting in West Virginia by state police forces.⁴ Self-loading rifles, better artillery, better bombs, faster propeller aircraft, larger ships, and even aircraft carriers, while innovations that first saw extensive use during World War II, were not considered weird or out of place because they had seen action or were developed many years earlier.⁵ It can be argued that weapons like the airplane and the tank, by virtue of their rapid adoption and age were considered conventional by the mid-1930s.

For the purpose of this thesis, “weird” weapons are those that are qualified as such by the individuals of the day. These distinctions can be found in the writings of the designers, the testers, and the high command figures that were responsible for approving their creation. In most cases the weapons are not outright called “weird”, in reality, the word is hardly ever used at all. Instead adjectives like “queer”, “strange”, “outstanding”, “fantastic” or even “nuts” are used

³ Edgerton, David. *The Shock of the Old: Technology and Global History since 1900*. Oxford: Oxford University Press, 2007. Pg. 31

⁴ "SEND ME TROOPS AT ONCE! --Gen. Bandholtz in West Virginia." *Chicago Daily Tribune*, September 2, 1921.

⁵ Edgerton, Pg. 142 – 144.

by the men and women involved in their creation or by publications that featured them. These buzzwords will be what this thesis looks to in its goal of qualifying weapons or arms programs as “weird”. Additionally, weapons that are unprecedented, or were never produced before or since, will be included in this study. Weapons that are new or simply “one offs” may not meet the qualifications for “weirdness”, but still merit research.

This thesis will be focusing on not simply the use-based history of these weapons, but also their developmental histories. Many of the weapons developed on either side were stranger during their development and this will be taken into account. Additionally, since many countries’ more outlandish projects like the Ice Ships in Great Britain, or most of Germany’s jet aircraft saw no use, their “weirdness” never leaves the blueprints or laboratories. It is important that study be done of both those designs that were built and used and those that were scrapped in the planning phase. This analysis must be made in order to understand what sort of “weird” was seen as acceptable and useful and what sorts were not. A vital question that must be posed here is why were these projects abandoned? Was it because they were deemed too weird or unconventional to merit creation? Were resources simply not available to devote to such projects? If the latter is the case, why did some projects receive funding and not others?

There are many similarities in the development of weapons and tools of war during the interwar period in the U.S., England, and Germany. All three of these nations worked on refining and perfecting the successful designs of aircraft, small arms, munitions, tanks, and ships that came out of the Great War. Tactics and strategies that catered to these peacetime weapons were also developed and tested either in equally peaceful situations, or in wars that these nations had a vested interest such as the Spanish or Russian Civil wars. Major refinements to weapons came from both state industries and private companies that saw a great deal of money to be made

from revolutionizing future wars. While it seemed that the “war to end all wars” was not going to live up to its title, the military industrial complex of these three countries focused more on rearming, improving, and expanding current developments.

More often than not, the tools developed in these two countries during the interwar period were hardly of an “amazing” or “weird” quality; rather they were the practical developments and refined iterations of tried and true weapons systems that came out the previous war. Aircraft, new and terrifying during the Great War, were refined to some degree or another in all three of these nations, but not always were the improvements great leaps forward. Holdovers, designs that saw little if any changes to basic design were common in all armies at the outbreak of war in 1939. After all, the Bismarck, Germany’s greatest pre-war battleship was sunk by British Swordfish biplane torpedo-bombers. Small improvements often saw more success than grand innovations. Machine guns were lightened, made to be crewed by two to three men rather than five or six. They were also built to be faster firing and easier to deploy than their grandfather the Maxim. Weapons like the man portable, bipod mounted Lewis Gun became the model for platoon support weapons during the interwar period. The Germans especially would see the usefulness of man-portable automatic weapons, and they would go on to make great use of them during the early years of World War II.

Some weapons innovations were hardly innovative at all; rather they took the hard learned lessons of the Great War and applied them to future problems. The German Mauser 98 was replaced as the standard German infantry rifle by its carbine cousin the Karabiner 98k. In the U.S., the Thompson submachine gun, developed as a “trench broom” would later gain fame as the choice of paratroopers, commandoes, and regular line troops alike. The Germans would use submachine guns to their fullest effect when combine with storm trooper tactics and

blitzkrieg.⁶ Self-loading rifles, toyed with during the First World War, only saw real development during peacetime or during World War II itself, but would become the standard for infantry arms the world over.

Armored fighting vehicles like tanks progressed from slow moving, heavy, stalemate breakers into slightly faster, slightly better armed stalemate breakers or into novo-cavalry. The fear of this new weapon and the lack of anything effective enough to stop them led to major gains in the first few battles during which they were fielded. Tanks are often credited with breaking the stalemate at the Somme in 1916. The Germans were terrified of these “monsters” and fled from their positions.⁷ The German Third Army Group called these weapons both “cruel” and “effective”. By 1939, the tank was the tip of the spear of the German blitzkrieg in their campaigns across Europe. While this frightful creation became a conventional weapon during the interwar period, the means of taking down the tank evolved little.

The Germans at the Somme went after the armored menaces with tungsten-carbide cored, armor piercing “K” bullets that could be used with their standard rifles and machine guns.⁸ The British and Americans had in their arsenal the .55 caliber Boys antitank rifle towards the end of the interwar period.⁹ As far as man portable anti-tank weapons were concerned, the future Allied powers were content to rely on what they had. Against the thinly armored tanks of the Great War, field guns and large caliber anti-tank rifles were deemed effective enough to take down these armored beasts. This naïveté would come back to haunt the British during their campaign in France and the Low Countries during the opening years of World War II. During the years

⁶ "SUPERIOR ARMS BLITZKRIEG KEY; COL, M'CORMICK: Information on New Form of War Held Vital." Chicago Daily Tribune, August 12, 1940.

⁷ Weeks, John. *Men Against Tanks*. New York: Mason/Charter Publishers, 1975. Pg. 21

⁸ Weeks, Pg. 22-23

⁹ Weeks, Pg. 32-33

following the First World War, weapons development, while innovative in many ways, was rather conventional.

Newspapers and science journals did not typically speak of the “outstanding” creations of government contracted arms manufacturers in the interwar period like they would years later. This was in part due to the secret nature of arms production in peacetime. In Germany especially, weapons development, an illegal venture under the conditions of the Treaty of Versailles, was undertaken in secret or in client states. Once Adolf Hitler officially repudiated the Treaty of Versailles, weapons developments were undertaken as a part of a grand strategy of rearmament and provided by state industries. In the U.S., arms development was often a private affair, where entrepreneurs could make their fame and fortune on effective designs. The “weird” did exist in many laboratories and workshops across most nations, but as the market for war winning, game changing weapons was no longer there, the profession saw a return to the conventional.

The following portions of this chapter will delve deeply in to the development of arms in Germany and the United States following the First World War. These sections will illustrate how, in these two countries, rearmament took on various forms and worked towards vastly different doctrinal and political goals. The primary difference between these countries was their goals for rearmament. In Germany, once the Nazi Party took power in 1933, the goals of rearmament were to ultimately win the war for German living space or *lebensraum*. Evidence from Hitler’s *Mein Kampf*, indicates that the eventual war for the soul of Europe was very much on the horizon. With this in mind, German weapons development followed the cutting edge tactic of “lightning war”. In the United States, arms research was not high on the priority for a country looking for a “return to normalcy”. Rather, the arms developed by the U.S. were

focused on national defense or were the result of highly competitive private firms. Only once war broke out in Europe did a serious push for the modernization of the arms used by the U.S. military occur. In Germany though, war was on the horizon, and arms producers had clear expectations as to what was needed to fulfill their strategic necessity.

“Lightning War”, Armored “Monsters” and State-Sponsored Rearmament: The German Example

In Hitler’s Germany, weapons development was undertaken by high ranking members of the Nazi Party. The weapons that Germany produced for their impending conquests were created largely with new tactics in mind, namely, *blitzkrieg*.¹⁰ *Blitzkrieg*, proposed by the Italian General Giulio Douhet, the next war would be a war fought and won in the air, and involve all aspects of a nation’s armed forces. Most importantly, this new tactic would combine the improved arms of the interwar period, tanks, submachine guns, and aircraft to completely destroy an opposing nation’s military capabilities and civilian populations. The two forces that would receive the bulk of Germany’s interwar arms production would be the Wehrmacht and the Luftwaffe.

In 1933, Hitler himself argued that motorized units would play a pivotal role in the next war.¹¹ The tank had ventured out of the “monstrous” realm and into the conventional. Over the next six years, the German High Command, Hitler especially, would work towards the mechanization of both the army, and society.

Armor development in Germany during the inter-war period would revolve around cracking the problem of how to use tanks. Some would argue for the tank as a fear weapon, similar to the Mark I’s from the Great War. This idea limited the potential of armor. Others

¹⁰ Cole, Hugh. "GENESIS OF THE BLITZKRIEG." *Chicago Daily Tribune*, August 25, 1940

¹¹ Ibid, 4

looked to the tank as part of a grander strategy. There was still much mistrust of the tank within some circles of the German military. These generals still argued that the cavalryman was the single most important element of a conquering force and that the tank was merely a bauble.¹² The push for the development of better tanks and their rapid production came from on high. Hitler gave hearty support to Heinz Guderian and Oswald Lutz and their armor-centric proposal for military organization and strategy.¹³ To emphasize a movement based war, the German armored force desired tanks to be independent.¹⁴ This approach, advocated by Colonel Oswald Lutz, would be extremely successful in the beginning of the War. Lutz saw the tank as a piece in the puzzle of a campaign as a whole and suggested that the main problem was how to get all other- infantry, aircraft, artillery- forces to support it.¹⁵ By 1936 with generous rearmament funding pouring in from the Fuhrer, Lutz and Guderian's proposal gained sway and the *blitzkrieg* tactic and the tank became standard equipment for armored divisions within the German Wehrmacht. The tank was to become the new cavalry in the German Wehrmacht, and their drivers the new knights.¹⁶ Ultimately, about 40 percent of the new armored officers would be former cavalrymen. This is indicative of a manner by which a largely new arm was given an ancient and conventional title to speed its acceptance.

The development of the German Panzer force would eventually branch out, as was the case in Britain, to both serve as a cavalry force and also an implement to aid the infantry. In order to keep their orders for more light tanks secret, the Reichswehr and the department in charge of weapons procurement of the Waffenamt listed these expenditures as "automobile

¹² General der Kavallerie a.D. M. v. Poseck, "Kavallerie von einst und jetzt," no. 43, 1934. Pg. 1434-68

¹³ Habeck, Pg. 206

¹⁴ Citino, R. M. (1999). *The path to blitzkrieg: doctrine and training in the German Army, 1920-1939*. Boulder, Colo.: Lynne Rienner Publishers. Pg. 204

¹⁵ "Zweck der Übungen", in Lutz *Anregungen und Lehren*, OKH, H25/24, 300, 6250580

¹⁶ Macksey, Kenneth. *Guderian: Creator of the Blitzkrieg*. New York. Stein and Day, 1975. Pg. 62

equipment”.¹⁷ The push for faster and heavier tanks often times came under the direct supervision of the Fuhrer, who did not hesitate to apply himself to minutiae of arms production. The first 150 light tanks produced by Krupp by the end of 1934, with mobility and *blitzkrieg* in mind, however, were little suited for combat.¹⁸ This is evidenced by the split developmental path of light tanks, such as the Panzer II, which would serve as a scout and exploitation vehicle, and the heavier vehicles as the spearhead that provides the breach of the enemy’s line.¹⁹ The production and further development of the tank would be bolstered largely by the mass rearmament campaign began by leaders of Nazi Germany.

In addition to rearming and reorganizing the Wehrmacht with armored units, Germany sought to refit the fledgling Luftwaffe with *blitzkrieg* in mind. The goal was to provide better long range bombers and ground attack aircraft to both pound the enemy in their cities and their forces on the front. Both of these focuses saw improvement and refinement to existing designs of aircraft. Dive-bombers, first tested in combat during the Spanish Civil War, like the Junkers Ju-87 “Stuka” were used as pinpoint, flying artillery. The wail of their infamous “Jericho Trumpets”, a wind powered whistle attached to the undercarriage, was a herald of the approaching German *blitzkrieg* from 1939-1941 when the Luftwaffe reigned supreme over Europe.²⁰

The Stuka, while terrifying, was neither a new, nor strange development.²¹ They were mono-plane creations that had competed in trials with other mono-planes in 1937 such as the Ha

¹⁷ Report of Krupp representative Wilhelm Prillwitz, “Btr: Angebot auf 4 Kl. Tr. für Heereswaffenamt-Beschaffungsabtlg” 24 February, 1933, BA-MA, RH 8/v, 2677. Krupp.

¹⁸ Habeck, Mary R. *Storm of Steel: The Development of Armor Doctrine in Germany and the Soviet Union, 1919-1939*. Ithaca, N.Y.: Cornell University Press, 2003. Pg. 187

¹⁹ Habeck, Pg. 211, Weeks, Pg. 36

²⁰ Evans, R. J. *The Third Reich at War*. New York: Penguin Press. 2009

²¹ Acme. THE STUKA OR DIVE BOMBER. *Chicago Daily Tribune* (1923-1963), Jun 02, 1940.

137.²² Mono-planes at this time were certainly nothing new; the Junkers J 10 was the first all-metal combat aircraft and a mono-plane introduced in 1918. The Ju-87 Stuka would become an effective piece of the proposed *blitzkrieg* puzzle, but was hardly a “weird” weapon, rather a useful innovation. The role of close support aircraft was almost more of an oddity than the airframe itself. Close support aircraft like this were a novel development of the inter-war period and Second World War but were effectively integrated into the German overall war plan.²³

There was also a push for the development of long range strategic bombers for use in the impending war. The Reich’s Air Ministry (RLM) commissioned its first long range heavy bomber to both the Dornier and Junkers companies in 1934 the parameters for which were an aircraft capable of carrying two tons of bombs over 2,500 kilometers.²⁴ This distance had yet to be achieved by the German Luftwaffe, but bomber designs with multiple engines carrying large payload, like the Gotha G.V had been used to bomb Allied cities in The Great War.²⁵ The first design submitted was the Junkers Ju 89, a four-engine design in line with aircraft, such as the American B – 17, designed at the same time. Another, the Dornier Do 19, participated in similar trials after 1936. The Do 19 was another conventional radial engine powered bomber whose only weird distinction was the inclusion of the Askania-Sperry autopilot, the first aircraft to carry such a system. By 1937 however, interest in long range strategic bombers had faded in the Luftwaffe. All projects for four-engine long range bombers would be halted before the war

²² Herwig, Dieter, and Heinz Rode. *Luftwaffe Secret Projects: Ground Attack & Special Purpose Aircraft*. Hinckley, England: Midland Pub., 2003. Pg. 22-24

²³ Small, A. (1941, Nov 22). BURY UDET, WHO GAVE GERMANY DREADED STUKAS. *Chicago Daily Tribune* (1923-1963)

²⁴ Herwig, Dieter, and Heinz Rode. *Luftwaffe Secret Projects: Strategic Bombers 1935-1945*. English Language ed. Leicester: Midland Pub., 2000. Pg. 20 - 23

²⁵ "Big German Battleplane Splendidly Designed". *Popular Mechanics*. October 1917

began; a mistake that, many have argued, severely hobbled the German war effort in the later years.²⁶

The air and ground arm of the *blitzkrieg* force of the future being outfitted, the Waffenamt turned its attention to infantry arms and mounts. The mechanized infantryman was very much an oddity that was created by the development of *blitzkrieg* tactics. Such troops had never been given an actual designation nor unifying tactic before the interwar period. To go along with the lightning war tactic, infantry had to keep up with the tanks. The motorized infantry regiment, a key element in Guderian's war of position, was to open up the wound caused by tanks and air attacks. Firepower and communication were to be brought together to "bring the entire depth of the enemy defense under simultaneous attack".²⁷ This attack plan required infantry mounted in vehicles that were capable of keeping up with the fast advancing armored column. Fritz Heigl, an eminent theorist of armored tactics in the inter-war period, in his "tank pocketbook," wrote that the possible answer for this problem was a sort of "infantry tractor".²⁸ Here entered the halftrack. This amalgamation between truck and tank (literally a half-tracked and half-wheeled vehicle) was a chimera of sorts that saw extensive use during the early part of the 20th century as farming equipment and later for personnel transport. The army would then be able to bring all of the cavalry aspects of the tanks (speed, firepower) together with the fighting abilities of the infantry. Heigl proposed that trucks could also fill this role, but in light of their proximity of the front line, something with armor was preferable.²⁹ In order to fully exploit their gains, the infantry had to also be armed in a manner suitable for a lightning war.

²⁶ Herwig and Rode, 2000, Pg. 23

²⁷ Guderian, Heinz, *Achtung-Panzer!* Tr. Christopher Duffy (London: Arms and Armor Press, 1992), Pg. 180

²⁸ Heigl, Fritz, *Taschenbuch der Tanks* (Munich: Lehmanns, 1926) (completed October 1925). Pg. 322-326

²⁹ Habeck, M. R. Pg. 75

As discussed earlier, The Great War had taught nations the value of the machine gun in defensive actions, but now, this weapon had to be turned into an arm of the lightning war. Submachine guns, automatic weapons firing pistol caliber rounds (as opposed to the rifle caliber machine guns), which were only tested during World War I, underwent perfecting changes during the interwar period. The original, the Schmeisser MP -18, first developed in 1916, was a design that went out of service after the imposition of the Treaty of Versailles, only to see a revival during Hitler's rearmament period.³⁰ The German infantry squad could be expected to, by the onset of the war, have many men armed with these weapons. Submachine guns like the ubiquitous Schmeisser and MP-40, developed in the late 1930s, gave the individual infantry man the power of rapid fire that previously only came from heavy, crew operated machine guns.³¹ Submachine guns acted as a force multiplier for infantry units during the early years of the war and, following the German example, many of the Allied armed forces hastened to adopt designs of their own. The Germans, however, outpaced the British and American in this case. This is despite the fact that the American Thompson, the unofficial U.S. and British submachine gun during the early war, had been available since 1920.³² In addition to submachine guns, the Germans also pioneered the idea of the General Purpose Machinegun (GPM), a lightened two-man version of the heavier crew served weapons of the First World War. The MG 34, first produced in 1929, would go on to hold the distinction of the first of these sorts of weapon.³³ The GPM was designed to bridge the gap between light machineguns like the Lewis gun or American BAR by combining their mobility with an increased rate of fire (around 800 – 900 rpm). These

³⁰ Gotz, Hans Dieter, *German Military Rifles and Machine Pistols, 1871–1945*, Schiffer Publishing, Ltd. West Chester, Pennsylvania, 1990

³¹ How germans make blitzkrieg. (1940, Aug 25). *Chicago Daily Tribune* (1923-1963).

³² Dime, Eric. "An Anti-Bandit Gun in Demonstration." *Popular Mechanics*, July 1, 1922, 41.

³³ Haskew, Michael E . *Small Arms 1914-1945: The Essential Weapons Identification Guide*. London: Amber Books. 2012. p. 92

were intended to increase the firepower of a unit on the squad level, rather than the platoon level that the old Maxims occupied. The Germans, who were already on a mass rearmament campaign, saw the potential of weapons that brought lightning war down to the level of the individual. These weapons, despite being definite oddities when they were first developed, had been used so extensively by gangsters and police alike in the U.S., that other countries, like Nazi Germany, saw their usefulness before the start of the war.

National Defense, Private Industry, Navy Conundrums, and the “Scientist of Wall Street”: The U.S. Example

Across the Atlantic Ocean in the United States, weapons development was vastly different from that which was occurring in Nazi Germany. Following the close of The Great War, the U.S. military underwent a series of demobilizations and shrinking acts in line with the politics of a “return to normalcy”.³⁴ With this came a reduction in military spending including a reduction of the United States’ standing army to 150,000 men by 1921 following the National Defense Act of 1920.³⁵ The late start that the U.S. had when it came to arms production is often explained by the effects of the Great Depression which limited the regrowth of American military. Major-General Frank McCoy would argue in an article for *The China Weekly Review* penned in 1939 that at no time in American history was rearmament so necessary and desperately needed.³⁶

The equipment provided for the United States Military was woefully inadequate, most of it being leftover from before The Great War. General Douglas MacArthur in 1933 went as far as

³⁴ Harding, Warren G., “Back to Normal: Address Before Home Market Club,” Boston, Massachusetts, May 14, 1920. From Schortemeier, Frederick E., ed. *Rededicating America: Life and Recent Speeches of Warren G. Harding*. Indianapolis: Bobbs-Merrill, 1920, pp. 223-229.

³⁵ Stewart, Richard W. *American Military History*. ed. Washington, D.C.: Center of Military History, U.S. Army :, 2005. Pg. 61

³⁶ McCoy, Frank. "America's Case For Military Preparedness." *The China Weekly Review*, February 11, 1939.

to say that the tanks and combat cars currently in the U.S. arsenal would be completely useless against any modern force on the battlefield.³⁷ The U.S. did not undergo the intense push for rearmament until the late 1930s when weapons like the self-loading rifle, long range bombers, and armored vehicles underwent testing and trials. He argued that the U.S. was unprepared for the Great War, and will be for any war brewing on the horizon. Many of these projects however, were undertaken first by private industries, as opposed to the state run rearmament programs in Germany at the same time. In a deposition in front of the Wadsworth Committee on National Defense in 1920, Secretary of War Newton Diehl Baker made it clear that it was the desire of the War Department to have a large airplane industry, but that such an undertaking should be left to “free enterprise”.³⁸ The development of weapons was thus, often left up to private industrialists who would then compete for government contracts. The Browning Automatic Rifle, Thompson submachine gun, aircraft by Douglas, Boeing, and Martin, vehicles from Studebaker, General Motors and others competed for lucrative government contracts. Such a system often precluded strange developments and as a result many of the creations that were on the “queer” side, found little success.

In the 1920s, following General Douhet’s thesis about the role of long range bomber aircraft in all future wars, a split was formed between members of the War Department and Army Air Corps. Advocates of Douhet’s thesis would argue for the importance of strategic bombing in destroying and demoralizing an enemy force at home. This view was counter to the popular Army view that aircraft should primarily be reserved for reconnaissance and frontline ground attack missions.³⁹ Vocal opponents to this traditionalist view, like Brig. General (acting)

³⁷ Ibid

³⁸ Lee, Edward Brooke. *Politics of Our Military National Defense*. Washington: U.S. Govt. Print Off., 1940. Pg. 84

³⁹ Stewart. Pg. 59

William “Billy” Mitchell, argued that strategic bombing was the future. Mitchell himself was so vocal in his criticism of the traditionalist view that he was demoted to Colonel in 1926 and court martialed for insubordination in 1927 which led to his resignation from the Army altogether. During the war to come, the B-25, a long range bomber, would come to bear his name.

One of the great advantages that the Americans possessed was civil aviation. At this time, airlines spanned the North American continent eventually reaching out as far as Europe, South America, and across the Pacific Ocean. This provided the industrial base for aviation along with new, privately developed improvements in airframes, navigational equipment, and communications technology. Without this civil base, the United States military would have missed out on, essentially, free research and development.⁴⁰ General Frank M. Andrews, one of the founders of the Army Air Corps argued extensively for the inclusion of a long range strategic bomber in the Army arsenal. He personally approved the Boeing B -17 as the Army Air Corps first long range strategic bomber in 1940 after intense trials beginning in 1938. He appropriated the bomber amongst much scrutiny and disapproval from the leading military minds of the day.⁴¹ The 4-engined, long range strategic bomber was not a weird creation, as the German examples have shown. Rather, it was the strategy of targeting civilian populations during wartime that delayed its full introduction. The wording of the National Defense Act of 1920 limited the production and adoption of arms to those of a defensive nature. Because bombers were inherently a non-defensive measure, they received rather muted support, and even outright condemnation from the U.S. government.

⁴⁰ Murray, Williamson and Millett, Allan R. *Military Innovation in the Interwar Period*. New York. Cambridge University Press, 1996. Pg. 107-108

⁴¹ Copp, DeWitt S. *Frank M. Andrews: Marshall's Airman*. Commemorative ed. Washington, D.C.: Air Force History and Museums Program, 2003. Pg. 12-16

One of the truly world changing developments to come out of the United States during the interwar period was the aircraft carrier and carrier borne planes. In 1912, the concept for a ship that carried wheeled aircraft was first proposed by British naval aviator Lieutenant Hugh Williamson.⁴² Williamson's proposal was met with rather muted response as battleships were still seen as the centerpiece of any naval group. Until this time, seaborne aircraft usage was limited, usually consisting of light seaplanes slung onto the sides of destroyers or stationed on small runway decks at the rear of the ship. Their roles were typically limited to scouting and reconnaissance. By the end of the war however, the British Navy had produced twelve carriers including the HMS *Argus*, the first capable of both launching and landing planes.⁴³ Other nations, like the U.S., lacked any sort of experience with this type of ship. Additionally, the stubbornness of the naval establishment in the United States rather precluded such innovations from the mainstream of thought. However, with the effectiveness of aircraft cemented by experiences in World War I, interest in dedicated aircraft carriers simmered quite fervently under the surface of the Navy's upper echelons. Almost immediately, proponents of naval aviation butted heads with the old school of battleship admirals. Even so, aircraft carriers gained support during the interwar period, especially in high political circles.

The aircraft carrier, while by no means a weird or unconventional creation by the interwar period, still saw intense resistance. A battle was brewing in Naval politics between those who saw the battleship as the centerpiece of any naval force, and those who saw the potential of swarms of carrier borne aircraft launched against an enemy. The progressive

⁴² Till, Geoffrey in Millett and Murray, *Military Innovations*. Pg.192

⁴³ Till, in *Military Innovations*. Pg. 194-195

thinkers of the day pictured a future where wasp-like fighters and torpedo bombers could drag the dreadnought down to the deeps.⁴⁴

The maritime forces of the U.S. military were able to devote the time and resources into developing and improving designs of this class of ship for two reasons: first, because the very real possibility of facing Japan as a future opponent in war (fears of this potential show down had been brewing since Japan proved its martial capabilities in the Great War and during its expansion in the 1920s and '30s), and secondly, because it did not possess an independent air force⁴⁵. Therefore, the defense budget for maritime based airpower was available and substantial. Even so, the U.S. Navy still had to work under “sound business principles” and thus felt the economic strain placed on all military branches⁴⁶. Aircraft carriers presented a viable solution to the problem of striking at Japanese interests in the Pacific, and their models served as a criterion against which the U.S. could judge tactics and weapons designs⁴⁷. Proponents of carrier based strike aircraft included World War I naval ace David Ingalls, the assistant secretary of naval aeronautics, and Admiral William A. Moffett, chief of the new Bureau of Aeronautics (BuAer). Moffett was such a zealous supporter of carriers in the Navy that even the President himself (Coolidge then Hoover) supported his plans and pushed for his repeated appointments as chief of the BuAer⁴⁸. The development of aircraft carriers was dominated by former airmen and their accelerated development and importance in the future war demonstration as much. Unfortunately for proponents of the aircraft carrier, the old “capitol ship” centric organizational belief within the Navy held rather strongly during this time. The rigid seniority system of the

⁴⁴ Connell, Robert L. *Sacred Vessels: The Cult of the Battleship and the Rise of the U.S. Navy*. Boulder: Westview Press, 1991. Pg. 46

⁴⁵ Till in , *Military Innovations*, Pg. 203

⁴⁶ Spector, Ronald, “The Military Effectiveness of the U.S. Armed Forces, 1919-39” in Millett and Murray, *Military Effectiveness*, vol. 2. Pg. 71-72

⁴⁷ Spector. Pg. 73, 82, 89.

⁴⁸ Domville, Adm. B., DNI, 19 Oct 1928, Adm. 116/3117, PRO.

Navy at this time gave members of the “Gun Club” substantial amounts of sway in political matters of naval developments, but the flyers did receive their due⁴⁹. The aircraft carrier would see extensive usage during the war and ultimately become the focus of naval strategy the world over. Even during the interwar period, Navy thinkers could see that the age of the battleship had come and gone.

Another naval development, while admittedly less grandiose than the aircraft carrier, came from a private source: the landing craft. Following the disastrous example set by the failed amphibious assault of Gallipoli during the First World War, it became rapidly apparent to members of marine forces worldwide that improved methods of seaborne assault would be vital in future wars. The United States Marine Corps, whose continued existence was very much in question during the interwar period, saw amphibious assault as the perfect niche to occupy.⁵⁰ In order to make this a reality, a technological gap was to be filled. This came in the form of the landing craft, a shallow draft, ramp-bowed boat heavy enough to move through choppy coastal seas under its own power, yet light enough to be carried on the davits of larger transports. The U.S. Navy and Marines were able to observe the craft used by the Japanese in their assaults during their expansion in their 1930s, and build upon those designs. Unfortunately, due to the U.S. defense policy, landing craft (not a very defensive vehicle) received very little attention from the Navy, despite the Marine Corp’s intent interest. The small navy office for landing craft turned to Louisiana boat-builder Andrew Higgins for help. In 1938, Higgins demonstrated to the office one of his 30 foot “Eureka” boats that had been designed to traverse the shallow bayous and swamps of his home state. The “Eureka”, despite its lack of a bow ramp, was an instant hit

⁴⁹ McBride, William M. "Challenging a Strategic Paradigm: Aviation and the Us Navy Special Policy Board of 1924." *Journal of Strategic Studies*: 72-89. Pg. 75

⁵⁰ Murray and Millett, Pg. 78

amongst the navy men and marines who observed it in action⁵¹. By 1941, the “Eureka” was redesigned with a bow ramp for the purpose of offloading troops directly onto a beach. This design would become the standard for U.S. amphibious assault craft for the remainder of the war.

The arms issued to ground troops of the U.S. Army and Marine Corps were also rather outdated by the mid-1930s. The Springfield 1903’s that were still the standard arm of both forces had first been designed around the turn of the 19th century. As with most other bolt action rifles, the Springfield was beginning to show its age. Rapid firing and self-loading repeaters, proven in small numbers during the Great War, were the way of the future. The development of American small arms such as the Thompson submachine gun is a story of a weapon that was at first received as a wonder, and later a curse. The Thompson, or Tommy Gun, as it came to be known is one of the few weapons whose military purposed design saw little attention from the military, and much from everywhere else where automatic weapons could find a place. Police forces across the nation battled it out with Prohibition Gangsters throughout the interwar period armed with the iconic “Chicago Typewriter”. Because of this sordid background, the Tommy Gun had a rather black reputation as far as small arms go. The Thompson, or more importantly its mechanism for the automatic loading of cartridges, the Blish Mechanism, was described as “queer” in a 1923 publication of *Popular Mechanics*.⁵² The Blish Mechanism was an oddity for its unique method of reciprocating the bolt of a rifle or submachine gun. The mechanism relied on friction and careful leakage of gas to create automatic fire. Most automatic or self-repeating bolt and gas systems like those found in the BAR (developed in 1918) or the Maxim machinegun (developed at the turn of the century) relied on simple recoil

⁵¹ Mountcastle, Maj. John W. "From Bayou to Beachhead: The Marines and Mr. Higgins." *Military Review* 70 (1980): 20-29.

⁵² Crossman, Captain Edward C. "A New Military Self-Loading Rifle." *Popular Mechanics*, March 1, 1923. Pg. 412-13

operation or gas bleeding. The Blish Mechanism used in the Thompson designs was a new development and found little success outside of these designs. The new Thompson self-loading rifle that was given for trials to the military was not approved for general issue. It would not be until 1936 with the development of the M1 by Springfield Arsenal worker John C. Garand that the U.S. military would accept a semi-automatic rifle into its service. The submachine gun, on the other hand, would be adopted across the country and that example followed with the onset of the war. As far as “weird weapons” go, the submachine gun’s wide usage and quick adoption rather precludes it from such a designation.

Other technological improvements that began in the laboratories of private citizens were seen as outlandish and even frightful. These creations, which would go on to change the course of the world in the upcoming war, were at the time of their conception the creations of a mad scientist.

Alfred Lee Loomis a Wall Street tycoon was a bit of an oddity as far as scientists went. An inhabitant of the extremely prestigious and high end Tuxedo Park village in New York, Loomis brought together some of the greatest minds of physics and engineering in the world to his private laboratory during the scientific boom of the interwar period. For Loomis, a highly successful business man, play meant experiments in his enormous private estate. He, along with notable minds like Robert Oppenheimer, William Richards (author of *Brain Waves and Death*), Albert Einstein, Niels Bohr and Heisenberg, pushed the limits of theoretical physics and biology in the Loomis Laboratory.⁵³

During The Great War, Loomis had been Chief of Research and Development at the Army’s Aberdeen Proving Grounds. While there he invented the Loomis (later Aberdeen)

⁵³ Conant, Jennet. *Tuxedo Park: A Wall Street Tycoon and the Secret Palace of Science That Changed the Course of World War II*. New York: Simon & Schuster, 2002. Pg. 62-67

Chronograph for measuring muzzle velocities and the “Loomis Shooting Cannon” prototype recoilless cannon.⁵⁴ He also tinkered with the new armored tanks. Loomis became such an expert on their construction that he built one in his garage at Tuxedo Park (much to the dismay of his neighbors) in order to make further improvements on the model. Never embarrassed by his own eccentricity, Loomis made the trip to Tuxedo Park’s small rail station to pick up the visiting Colonel Henry L. Stimson in the model tank. While noisily clanking home, Loomis, Stimson turned to him and said, “Now this is the way to protect the nation”.⁵⁵

During the interwar period, Loomis would go on to work on so-called “whispers of death”; sound waves capable of killing bacteria, boiling eggs, and frying frogs.⁵⁶ The prospects were terrifying. According to *Popular Science* in August 1928, he had discovered “strange ‘burning sounds’” that were inaudible to human ears, yet could tear apart a cell with super sound. While not a seemingly military development, the real importance of Loomis’s “super sounds” would not become apparent until later. Once a method for the measurement of such sounds over a distance was developed, the scientists of Tuxedo Park applied their discovery to detection. Unbeknownst to Loomis in 1928, he had discovered the basis of radar and eventually, nuclear fission.

By 1939, Loomis, who had kept a close eye on Germany’s military progress in Europe, had opened his laboratory to researchers who were specializing in ultrahigh-frequency microwave projects. That summer, Loomis, in a correspondence with his colleague Vannevar Bush discussed the matter of “distance finding by radio”.⁵⁷ During the 1930s microwave

⁵⁴ Patent No. 1,376,890, issued May 3, 1921, to Alfred L. Loomis, Paul Klopsteg, Paul G. Agnew and Winfield H. Stannard, for “Chronographs.”

⁵⁵ Conant, Pg. 34

⁵⁶ Dowd, George Lee. "A Scientist of Wall Street: After a Hectic Day on the Market Alfred L. Loomis Turns to His Laboratory as a Hobby -How He Discovered Sounds That Burn." *Popular Science*, August 1, 1928, 43 and 136.

⁵⁷ Conant, Pg. 129

research was being undertaken simultaneously and secretly by most military powers in the world including the U.S., Great Britain, France, and Germany. The goals of the projects were the detection of ships across large bodies of water and aircraft. The threat of long range bombing made real by the German and Italian air forces during the Spanish Civil war made the necessity of radar all the more real.

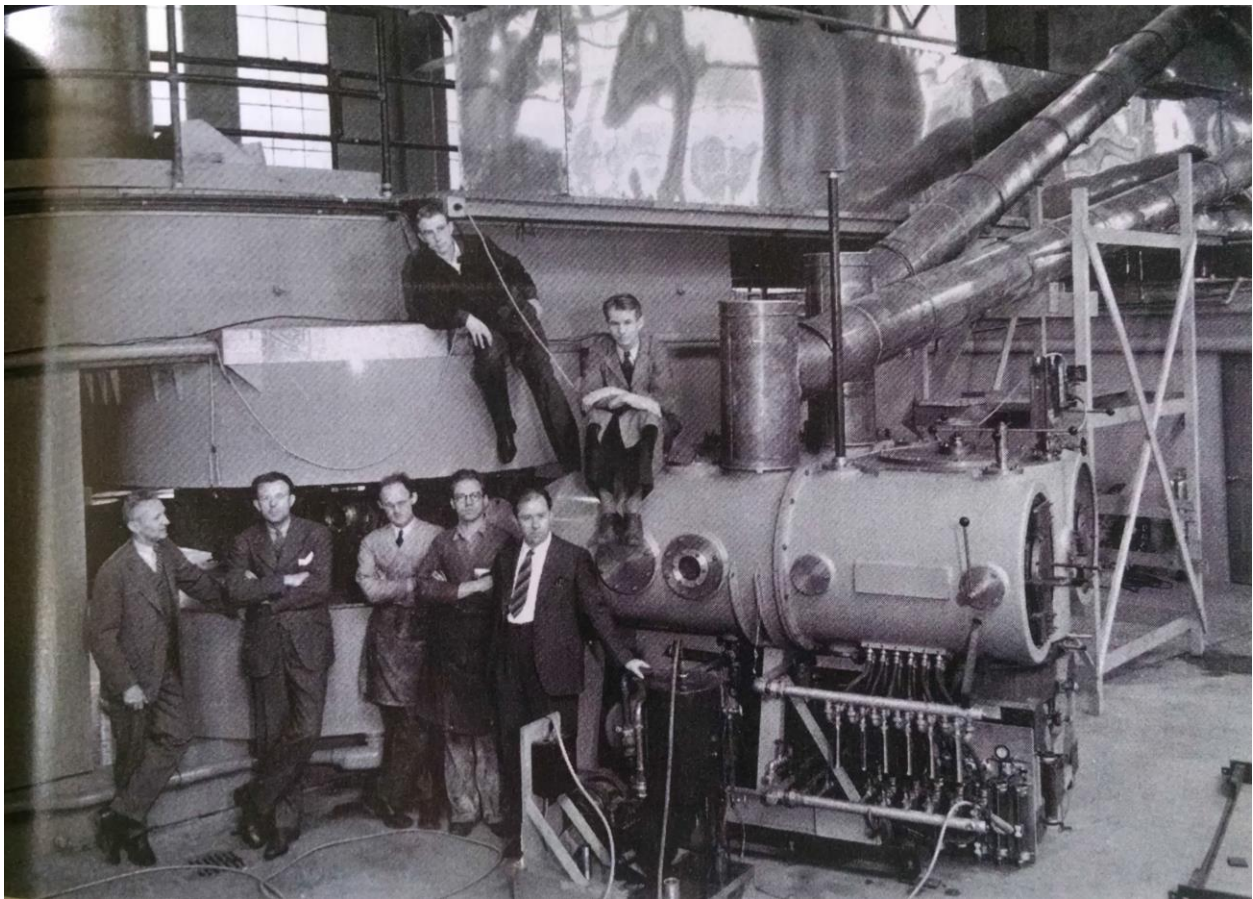


Figure 1

Loomis' work in his private lab revealed the potential of focused microwaves against biological systems (cells), but its real value for the time came from applying the Doppler Effect to wave measurement and object detection. The project that ultimately became radar was undertaken between 1935 and 1940 in part by Loomis and others and was kept an absolute and

total secret.⁵⁸ Between 1935 and 1938 various small radar installations were placed on the outlying British Isles in the English Channel. The Chain Home network system, as it was known, was an early warning system that would prove invaluable during the early years of the war and the Blitz. Radar would eventually be applied to U.S. ships, ground installations across the U.S. and Britain (such as the Opana Radar Installation that caught the beginning of the Attack on Pearl Harbor), and much later aircraft. This thesis will also discuss Loomis' research as it was used in a different wartime "weird" weapon in later chapters: the Atom Bomb.

Conclusion

The arms developments undertaken in both the United States and Germany during the period between the wars focused on conventional developments over new and strange ideas. State run industry dominated the development of arms in Nazi Germany especially as Hitler saw rearmament as an opportunity to pull Germany out of an economic depression. The Germans' developments were designed first and foremost to cater to the new *blitzkrieg* strategy first proposed by the Italian General Douhet. They pushed for new infantry weapons like the submachine gun and lightened crew machinegun like the MG 34 following Hitler's repudiation of the terms of the Treaty of Versailles. They also pushed for the improvement of the terror vehicle of The Great War, the tank. Their new designs would come to define the campaigns in Poland and France as the face of lightning war. New tanks and armored vehicles were simply improvements on designs that had been tried and tested as effective during the Great War. The development of better bombing and close support aircraft similarly followed this trend. Much of the controversy of the arms development of the interwar period in Germany came not from the weapons themselves; rather, the strategy for their use attracted more debate and concern.

⁵⁸ Conant, Pg. 187-190

In the United States, private individuals and personalities often were the driving force behind arms development and research. Men like Loomis, Mitchell, MacArthur, and Andrews were some of the driving forces behind U.S. rearmament and research. While some of their ideas were approached with extreme caution and outright fear in some cases, they pioneered some of the defining technologies of the Second World War. Loomis especially developed technologies that were outright considered strange, yet after some acceptance found great success. Unfortunately for the United States, demobilization efforts had severely limited their armed forces and no sweeping effort for rearmament existed until the late 1930s. By this time Germany forces were pushing across Europe, requiring the U.S. and her future Allies to scramble for solutions to military problems during wartime. This led to an increased acceptance of strange and unconventional weapons ideas that had never been seen before.

Chapter 3

The Weird in the Early Years of the War: 1939-43

With the outbreak of the World War in Europe and the Pacific, countries either initiated attack plans long in the making, or scrambled to protect their interests with ever arm at their disposal. For Great Britain, the war put the whole of its armed forces on the back foot. Research and development in England turned to weird, yet practically useful designs to defend against the Nazis who rapidly enforced a chokehold on the home isles. The Americans continued to look to private individuals for their oddball arms, but were still behind on their conventional stocks after being so insular during the interwar period. In Germany, the war provided the perfect excuse and opportunity to replace its old conventional stocks with new world changing designs. Some of the most unconventional and strangest designs of the Second World War were proposed or fielded during this period. Unfortunately, because many of those designs never went further than the drawing board, their creators thought and wrote little of those designs. Much of the weapons development field at this time involved throwing ideas against the drawing board and seeing what stuck. Sometimes this produced terrifying, yet strangely effective devices; other times, very spectacular failures. Until now, most of the weapons that had been created in preparation for the war have been relatively easy to comprehend; they were developments or improvements on existing designs or combinations of existing systems. The weapons discussed in these next two chapters are distinctly not of this quality. Most are designs that had never been seen before and many were never seen again. These were the inventions of eccentrics and dreamers. Some

would shake the world of arms to their foundation; others were technological dead ends or too strange to ever see use.

The arms of this period were considered “weird”, “strange” or “outstanding” usually in the writings of their designers, or by their observers. By “the early in the war” we mean to focus on the developments that began or came about from the start of the war until Germany’s decline following the Battle of Stalingrad in February of 1943. This event represents a shift in the war for Germany and marks the start of an increasingly desperate struggle for that country. For the United States, the early months of 1943 witnessed their first major land victory against the seemingly unstoppable Imperial Japanese Army at Guadalcanal. Additionally, in early 1943 “total war” began to take hold of the American economy as the entire nation took on a war footing. In Great Britain, early 1943 marked the end of the North African Campaign and the beginning of renewed offensive operations on the continent after the disastrous evacuation of Dunkirk. This chapter will seek to analyze some of the arms created before this time and how they impacted the conflict and the future development of weapons.

The unique features of weird weapons development was completely dependent on the nations in which they were created. For Great Britain, Germany, and the United States, their unique geographical, economic, strategic, and governmental systems all influenced the manner in which weird ideas were pursued and the end products. Ultimately, the weapons that were created at this time may provide some insight as to what factors led to the promotion, creation, or failure of certain designs over others.

The designs that were accepted by the British seem to be associated with practicality in the face of material or manpower shortages. The weapons that they designed throughout the war were designed to work with what they had during the war. The stresses caused by the war forced

the British to arm their populace with simple and innovation, yet weird creations during the early years of the war. The weapons that the British approved, and were actually used in combat, were rarely those that required large amounts of resources or were impractically far reaching. Private individuals drove American designs much like during the interwar period. Tinkerers, scientists, and individuals of engineering renown stepped up to provide their designs to the American military. The designs of the early war were the designs of not-so-mad scientists in the United States. The two strangest involved harnessing animals in some capacity or another, but neither were fielded. In the U.S, the focus during this time remained on rearming, so oddball creations did not come from within the military establishment as much as private individuals looking to help. The Germans during this time used the buffer created by their conquests to further their research into jet aircraft and pursue grand designs of raining hellfire across the globe with ultra-long-range bombers. Central planning and the organization of the Nazi state served to both drive and hinder the efforts of the Luftwaffe on these projects.

Most if not all of the weirdest weapons of the war saw their developments heavily influenced by highly placed individuals. They often received attention, or approval for fielding at the behest of a leader, or highly placed officer. The interpersonal relations between soldiers, bureaucrats, and weapons designers drove research and development during the war. All of this was also only made possible by the war itself. As the interwar period has shown us, weapons development then was focused on fighting the last war. The designs of the last war were improved and built upon, but weird innovations were scarce. The war provided the exigency for new arms to address new problems. Weird weapons were developed as a result of this urgent need and this is evident in many cases where the ideas were half-baked and doomed to fail, or in those cases that worked perfectly, but were strange even to the designers.

“Unusual, but Respectable”: Macrae, Churchill, and the “Toyshop”: The British Example

During the opening years of the Second World War, the tactics and arms produced during peacetime saw their first tests in battle. The tactics that these weapons were developed to bolster and support also saw their first widespread use. The early years of the war were thus the testing phases of many weapons that were otherwise unproven in combat (outside of secondary conflicts like the Spanish Civil War or Bolshevik Revolution in Russia). Submachinegun and carbine armed German troops and fast moving armor units squared off against their French and British counterparts on the Western Front. Despite making early gains during the so-called *drôle de guerre* or Phony War during the autumn and winter of 1939, the British and French neither advanced substantially into Germany, nor did they make any firm attempts to engage the German forces. The lack of action by the Allies at this point at least served to provide time for England at least to rearm.

At the heart of this rearmament push were the men and women who worked in various departments of the British military, including the offices of Military Intelligence (research) (MIR (c) and the Ministry of Defense 1. This department, which would produce some of the most bizzare and ingenious weapons of the early war period, was the brainchild of Major-General Millis Jefferis and Colonel Stuart Macrae a former editor of *Armchair Science* magazine.⁵⁹ The idea was for the department to produce some “unusual but respectable” weapons.⁶⁰ Both of these men were inventors and tinkerers who saw the war as an opportunity to not only serve their country, but also make a name for themselves in the arms industry. The Ministry first went to

⁵⁹ Macrae, Stuart. *Winston Churchill's Toyshop: The inside Story of Military Intelligence (research)*. Stroud: Amberley, 2010. Pg. 26

⁶⁰ Macrae, Pg. 21

work only months before the outbreak of the war and created some truly unconventional solutions to tactical problems.

At the outbreak of the war, Macrae and Jefferis along with Captain C.V. Clarke, whom Macrae called a “character” with an “unusual” personality, set out first in making a ship-sinking device in June of 1939.⁶¹ The original request, by Jefferis, was to create a magnetic mine that could be carried by a diver and used to blast a hole in the side of a ship at harbor. Clarke and Macrae started to work right away. Their creation, dubbed the “Limpet” by Macrae, would eventually be used in all theaters of combat and ultimately be adopted and used in one iteration or another by various countries special forces until the present date.⁶² The design was an improvement of an Italian device used in 1918, but the development of the Limpet involved some rather outside-the-box thinking and “weird” solutions to material problems. Their laboratory consisted of a bench in Clarke’s garage. Their creation, essentially two Woolworth’s bowls with magnets around the lips and explosives in the middle, proved to be a solid design in need of a reliable firing device.

The firing device itself was created using a spring loaded firing pin delayed by chemical pellets. The initial tests with the pellets proved that no two of these delayers melted exactly alike which would present major problems to any would-be Limpeteer. The answer came from one of Clarke’s children: candy, aniseed balls to be exact. According to the manufacturers, Messrs Barratt, the aniseed balls were purposely made to dissolve at the same rate using a specific dipping method in various candy liquid vats.⁶³ To keep the aniseed balls from getting wet while

⁶¹ Macrae, Pg. 15-19

⁶² Crile, George. "Ch. 22: Muhammed's Arms Bazar." In *Charlie Wilson's War: The Extraordinary Story of the Largest Covert Operation in History*. New York: Atlantic Monthly Press, 2003 Pg 318 and "Rainbow Warrior sinks after explosion". *On This Day* (British Broadcasting Corporation). July 10, 1985

⁶³ Macrae, Pg. 19-20

in use, Macrae and Clarke used the common everyday prophylactic condom as the rip-away seal. The resultant rush to supply the production of the Limpet gave both Clarke and Macrae a reputation amongst the town's chemists as accomplished sexual athletes.⁶⁴ The Limpet, the result of various household items, some powerful magnets, and high explosives, was given to the so-called Cloak and Dagger boys of the Special Operations Executive (SOE). Other weapons to come out of MIR (c) were equally unconventional and were also intended to fill specific gaps in the British arsenal.

Once spring of 1940 rolled around and the Germans had closed the Polish campaign, the Wehrmacht and Luftwaffe wasted no time in advancing west. The German blitzkrieg tactic, which combined close air assault and armored superiority, either quashed or sidestepped French resistance. Tanks especially became the face of the German advance on the Western Front. The British Expeditionary Force on the continent was stymied in their attempts to engage the superior German Armored units with their comparatively light tanks. French models, often times better armed and armored than their German counterparts, were rapidly overwhelmed as they were used as attachments to infantry units rather than in dedicated armored units. With the fall of France in June of 1940, the British were left alone to face the unstoppable German *blitzkrieg*.

The key to solving this puzzle was to provide a cheap, man-portable means of disabling an AFV (Armored Fighting Vehicle) that required little to no specialized training to use. Often times in France, the infantry of the BEF found itself without armored support and no suitable means of destroying German tanks. Until this point, the men of the British Army relied on technologies that were holdovers from the Great War for stopping armor. Weapons like the Boys Anti-tank Rifle, or other so-called "elephant guns" had long since been outclassed by

⁶⁴ Ibid, 5

increasingly heavy armored plating which had become the norm for interwar armored vehicles. Following the disastrous retreat from Dunkirk in the summer of 1940, fears of German armored columns rolling across the British Isles became all too real. A means to stop German tanks that could be issued to the regular army and Home Guard had to be invented and produced rapidly. The solution came from the minds at the MIR (c) and MD 1. Their solution: the Sticky Grenade.

The development of the Sticky Grenade is a twisting, turning path through politics and science that ultimately would produce a weapon that is both significant for its use and for its weirdness. The bomb shows us how desperation and ingenuity could combine to produce unconventional solutions to significant problems. The S.T. grenade was a one of a kind development that had not been attempted until the outbreak of the Second World War, nor since.

The proposed solution to the armored problem was to develop a grenade that, when thrown, would stick to the tank and disable it—the only catch being that the grenade must contain either a shaped charge or, as the engineers put it, be able to “poultice” to the tank. The design was at first given to Dr. Bauer and Dr. Schulman of the Colloid Science Department of Cambridge University in 1940, but as the months went on and the fear of invasion became more and more real, little progress was being made.⁶⁵ The setbacks for this weapon’s development were piling up faster than solutions could be found. The original proposal was itself an odd request, and as a result, was proving to be a tough nut to crack.

Up until this point, there had never been anything like this developed; the grenade was simply unprecedented.⁶⁶ The other creations that were proposed to the Home Guard for antitank operations were simply not up to snuff either. Weapons like the Blacker Bombard or the Self-igniting Phosphorous Grenade (basically a Molotov cocktail with improved components) were

⁶⁵ Ibid 1

⁶⁶ Weeks, John. *Men Against Tanks*. 1st ed. Vol. 1. New York: Mason/Charter Publishers, 1975. Pg. 42-43

either too heavy to be given to individuals (in the case of the Bombard) or too dangerous for the operators (in the case of the glass SIP grenade). So a middle ground was to be met. The weapon had to be man portable, and safe, while still being uncomplicated enough for the Home Guard to use. The lack of any better alternatives and the approval of the sticky bomb concept shows just how desperate and full of fear Great Britain was when it came to the Nazi's armored blitzkrieg.

The first iteration of the Sticky Grenade involved the two Cambridge doctors throwing "rubber sausages" at walls with no effect.⁶⁷ Macrae was having such a difficulty with the bomb that he claimed if anything would have driven him to drink, the Sticky Grenade would have been the thing to do it.⁶⁸ The problems were both in the development of the weapon and the politics of arms in Britain. As for the developmental problems, the difficulty could be found in the design itself.

Creating a grenade that would stick when thrown or smashed against an armor plate was easier said than done. The Cambridge doctors had originally tried dipping explosive containers in a rubber adhesive solution (the "sausages"). Unfortunately, the rubber solution was not sticky enough, nor the explosive effective when it stuck because of the lack of surface contact with the armor.⁶⁹ What was really needed was something that would *squash* when thrown against a hard target. The idea was proposed to fill a fabric bag with semi-solid nitroglycerine explosive and coat it with a better adhesive solution. The bag itself would spatter against a tank's hull when thrown and stick if the adhesive were effective enough. A handle was added to ease throwing (it is quite impossible to hold a bag covered in glue after all) and the fuse from the standard Mill's

⁶⁷ Macrae, Pg. 109

⁶⁸ Ibid 9

⁶⁹ Macrae, Pgs. 109 - 112

hand grenade added as the firing mechanism. This proved unsatisfactory as the bag destroyed all hopes of accurate throwing.⁷⁰

The answer was to wrap the glue soaked bag around a glass sphere filled with the semi-solid explosive. This had the effect of both keeping the grenade in a rigid form for accuracy, yet would still poultice when the glass broke against a hard target. The sticky solution that coated the bag, however, presented itself a new problem; it had to be sticky enough to adhere to a tank, but not the operator.

One of the Cambridge doctors proposed birdlime as the best compound that they had tested. This adhesive compound had been used for years to entrap songbirds in rural parts of Europe for consumption. Its use is simple, yet devious. A farmer had to simply coat the branches of his trees with the sappy, syrupy goo and any birds unfortunate to land would be entrapped by its stringy tendrils. Birdlime was seen as a good alternative to the rubber solution as it was viscous enough to spread or splatter, and also incredibly sticky. Ultimately, the birdlime used would come from Kaye Brother's Ltd of Stockport.⁷¹ The components combined were effective when either thrown or placed upon an armored panel.

The result was a handheld antitank weapon that would penetrate an inch or so of armor or severely damage anything thicker.⁷² Unfortunately for the minds behind the bomb, politics proved to be more ensnaring than the device they had developed. The problem was operator safety. The bureaucrats at the Ordinance Board were concerned with the explosive compound that had been developed by Imperial Chemical Industries (ICI) that had not been officially approved. The belief was that anything to come from nitroglycerine would invariably share its

⁷⁰ Macrae, Pg. 110

⁷¹ Ibid 12

⁷² Weeks, Pg. 43

volatility. After sufficiently proving its safety (by smearing the compound on a friction engine and turning it on for hours), the S.T grenade was approved for testing. Macrae tested many dozen of the S.T Grenades personally. Prototype S.T grenades were demonstrated for various members of the British government and armed forces. The weapon finally received its approval at the request of none other than Winston Churchill himself. On June 1, 1940 a scribbled note on



Figure 2

10 Downing Street paper was delivered to M.D 1 “Sticky Bomb. Make one million. WSC”.⁷³

The S.T Grenade had received its official marching orders and would go on to be used by the Home Guard, British Commandoes, South African troops, and Australians in New Guinea.

While not the most effective or deadly anti-tank weapon ever to be developed, the Sticky Bomb is an example of how an unconventional or “weird” design could go from being “rubber sausages thrown against a wall” to being approved by the Prime Minister of Great Britain himself. This weapon was just one of many of the oddball designs that came out of Winston Churchill’s Toyshop, others included the PIAT anti-tank launcher, the Aero Switch an aircraft sabotage weapon, and bridge laying tanks, but the sticky grenade stands out as it was a technological oddity. Its design and concept was really only attempted this one time and never reproduced. It serves as an example of how a rather strange idea was used as a stopgap measure during Britain’s most desperate hours during the Second World War.

Pyke and the Ice Aircraft Carrier

In 1942 as the shipping lanes around the British Isles were rapidly tightening under the threat of Hitler’s Wolf Packs, a new idea for the construction of ships was proposed to Lord Louis Mountbatten by the inventor-journalist Geoffrey Pyke.⁷⁴ Pyke proposed building ships out of ice. Once the laughing in the room had subsided, the inventor, with his ease charm and simple sounding plan gave his presentation.⁷⁵ Ice was strong, buoyant, and was easy to make. Naturally though, this was no ordinary ice; the ships proposed by Pyke were to be made of Pykrete: a mixture of water and wood or hemp pulp and then frozen. The resultant mixture had the strength of concrete with a unique self-healing quality as bullets passed into it and the ice

⁷³ Macrae, Pg. 111

⁷⁴ Public Records Office, Kew, UK (hereinafter PRO) ADM 116/4818, 23 September 1942

⁷⁵ Goodeve, Sir Charles. “The Ice Ship Fiasco.” The Evening Standard, April 19, 1951

reformed around it. Sir Charles Goodeve, a Canadian chemist who helped develop the “hedgehog” anti-sub device during the war, writing about the proposal called it a “fantasy”. But Pyke was not deterred, his material (cut into small blocks) proved to be effective when fired upon with a pistol, and thus reasoned it would be invincible against bombs, torpedoes, and cannon fire when fielded in large quantities.⁷⁶ When testing the material’s supposed imperviousness to weapons fire, Pyke fired a pistol at a block of the mixture. The bullet ricocheted off the block and buzzed amongst the feet of the officers present, causing quite the uproar (the idea being that a large enough platform, built of Pykrete, would be able to serve as a floating aircraft station or fueling platform for other ships).⁷⁷ This aircraft carrier, were it to be stationed in the North Sea and built to mimic the size of similar steel ships, could help to turn the tide of the naval war in the Atlantic and the air war over Europe.

With the approval of Mountbatten, Project Habbakuk was initiated. The name was taken from the Holy Bible, Habakkuk, 1:5, “I will work a work in your days which ye will not believe though it be told to you”. The verse seemed remarkably fitting for such an odd undertaking. Pyke’s invention proved, in small scale tests, to be reliably buoyant and melted much slower than regular ice, if kept chilled. So it was to be that in winter of 1943 some 2,000 chilly soldiers would be stationed on a 1,000 tonne test carrier in Lake Patricia Canada.⁷⁸ Ultimately, the test proved that Pykrete not only will melt when exposed to too warm of temperatures, but it also was prone to vaporization, much like dry ice⁷⁹. This, of course, lead to massive setbacks for the project and ultimately it was cancelled. Its cancellation came in part due to its impracticality and

⁷⁶ Gold, Lorne W. "Building Ships from Ice: Habbakuk and after." *Interdisciplinary Science Reviews*, 2004, 373-84. Pg. 373

⁷⁷ Alanbrooke, Alan Brooke, and Alex Danchev. *War Diaries, 1939-1945: Field Marshal Lord Alanbrooke*. Berkeley: University of California Press, 2001. Entry for 19 August 1943

⁷⁸ MacQueen, Ken. "Ice Ships and Peace Plans." *Maclean's*, January 1, 2004, 198-200

⁷⁹ Goodeve

as more conventional designs became more readily available from the United States. From the beginning, Habakkuk was most likely doomed to failure as it was far too impractical with Great Britain's already stretched resources. The project was abandoned, but the interest in Pykrete never faded amongst private inventors and tinkers who are still interested in seeing whether or not Habakkuk is still feasible today.

Organic Control and Bomb Guidance: The American Example

Another area of arms development that saw specific problem-solution research was in the development of guidance system for aircraft bombs. At the outbreak of the war, little beyond "dumb" (unguided) bombs was available to the world's air powers. These bombs, as demonstrated by the hundreds of bombing raids against cities and strategic targets, often missed or caused massive collateral damage despite being used with then state-of-the-art bomb sights like the U.S's Norden. Radar guided, bomb laden gliders had been toyed with during the interwar period by both the Americans and the Nazis at this time, but had not shown great success⁸⁰. The conventional means of blasting ships out of the water, vehicles out of the field, and aircraft out the sky meant putting pilots well into harm's way. The range of conventional rockets, bombs, machineguns, and aircraft cannons was short to the point of forcing the pilot through various type of antiaircraft fire to hit their targets. The militaries of many countries were searching for new means of engaging targets from a suitable standoff distance. This meant some sort of guidance or homing systems. This was a new and upcoming field of arms research and the proposed solutions to this problem were often times utterly absurd.

In 1939 Warsaw was laid to waste by the German Luftwaffe in a series of nighttime air raids. The city burned as correspondents from newspapers and radio services transcribed the

⁸⁰ "IDEA THAT NAVY FORGOT REVIVES AS NAZI WEAPON." 1943. *Chicago Daily Tribune* (1923-1963), Sep 26, 17.

horror of the first usage of air power against civilians of this new conflict.⁸¹ Reporters described “puffs of antiaircraft fire” appearing in the sky as the powerful twin engine Ju-88s and Stukas made repeated bombing runs against the city. This was the background against which Project Pigeon began.

In the 1930s an enterprising behavioral scientist by the name of B.F Skinner was working with animal behavior and conditioning —specifically, how animals may be conditioned to repeat an action while expecting a result, the action hinging upon the “lower organisms” heightened signaling and detecting system.⁸² With the bombing of Warsaw and the increased potential might of airpower suddenly very apparent, Skinner turned his research to guidance. In an article written after the war, after the research was declassified, Skinner described his work and how his behavioral psychology studies fueled a “crackpot idea” on the wrong side of the tracks intellectually⁸³. Originally, the idea was to place a pigeon trained to peck at a target inside the nose cone of a surface-to-air rocket in a harness that turned the rocket so as to guide it into an attacking aircraft. The idea proved to be easier said than done. The difficulty with the rocket design was too top heavy, resulting in what Skinner called “pigeons in a pelican”; meaning the beak (of the rocket, containing the pigeon harness) was larger than the stomach (the explosive payload) of the bird. The initial design was thus a failure: it had an effective (albeit cruel) guidance system, but little punch. As a surface to air weapon, the Pigeon Missile was an utter flop.

However, fortunately for Project Pigeon’s survival, a new target and opportunity presented itself as the War progressed: maritime shipping. The Japanese attack Pearl Harbor on

⁸¹ "Former Shanghai Correspondents Describe Warsaw Bombing Terrors." 1939.*The China Weekly Review* (1923-1950), Oct 07, 1939

⁸² Skinner, B. F. 1960. "Pigeons in a Pelican." *American Psychologist* 15 (1): 28-37. Pg. 28

⁸³ Ibid 17

December 7, 1941 catapulted the United States into the War and opened new avenues for research and arms development. Skinner's pigeon guided weapons were no exception. With help from Keller Breland, then a graduate student at Minnesota, Skinner reworked his harness system from a rocket, into a guided bomb. The idea was rather simple: reinforce a behavior (pecking a ship on a screen) with positive reward (food pellets, specifically hemp seed).⁸⁴ The scientists presented a demonstration film to two psychologists working for the War Department, Charles Bray and Leonard Carmichael. The film itself shows pigeons, with electrical leads attached to their beaks, pecking at images of Japanese ships projected on a screen.⁸⁵ This was to simulate the nose cone of a 2,000 lb bomb dropped from a long range bomber. Skinner and his fellow scientists trained the pigeons intensely; they accounted for and tested how changes in altitude, pressure, vibration, and loud noises (pistol shots).⁸⁶ Skinner's idea was soon picked up in 1942 by General Mills, Inc who provided a donation for further research in hopes that a government organization would soon pick up the idea.⁸⁷

The idea would be presented to the U.S. National Defense Research Committee with the claim that if the bomb was dropped within 2,000 feet of an enemy warship, the pigeons would perform effectively. The project began to receive positive attention from the U.S. military and various simulators created by General Mills. The pigeons performed remarkably for such a "crackpot" idea. One government contractor, after observing the test results in late 1943, proclaimed that this guidance system preformed "better than radar!"⁸⁸ Unfortunately for Project Pigeon, the military withdrew its support in 1944 as the development of the bombs began to stall

⁸⁴ Skinner, Pg. 30

⁸⁵ *Project ORCON*. United States, 1942. Film.

⁸⁶ Ibid 19

⁸⁷ Ford, Brian J. *Secret Weapons: Technology, Science & the Race to Win World War II*. Oxford: Osprey, 2011. Pg. 196

⁸⁸ Quoted from Skinner Pg. 33

despite the argument by Skinner and his colleagues that they had created a unique, jam resistant, homing device for attacking moving targets. The Project was soon abandoned, but later revived post-war under the name Project ORCON (Organic Control). Ultimately, Skinner would argue that his project was mothballed during “combat application” research as the military focused on a different project whose combat application would come at Hiroshima some one and a half years later⁸⁹. ORCON would also ultimately be disbanded as radar guidance technology outpaced animals and behavioral psychology in the 1950s.

Tactical problems like sinking a moving ship, or knocking an aircraft out of the sky were problems that had conventional solutions, but also lots of room for improvement. Project Pigeon, and later Project ORCON are examples of how weird ideas could serve to bridge the gaps in a country’s arsenal as other seemingly conventional technologies (like radar or radio control) caught up.

“This man is *not* a nut.” Lytle S. Adams and the Bat Bomb

With the bombing of Pearl Harbor on December 7th, the United States found itself in a bit of a bind about getting revenge on the Japanese. What was needed was a large scale terror weapon that could be used to strike back at the Japanese on their home soil without endangering large amounts of American lives. Large scale bombing raids on the Japanese homeland were utterly out of the question as there was no suitable landing or launching points in the Pacific with the pressure on the Philippines and the fall of American outposts like Guam. One rather eccentric individual laid out his plan for a terror weapon in a letter to President Franklin D. Roosevelt himself. That man was Dr. Lytle S. Adams, and his plan was perhaps one of the strangest military operations ever sanctioned by the United States.

⁸⁹ Skinner, Pg. 34

Adams' plan involved dropping over 200,000 incendiary laden bats, a creature associated with the "underworld" and "evil", over the island of Japan where they would disperse, occupy structures, and set the whole country ablaze.⁹⁰ The proposal laid out Adams' plan, nominated various businessmen and scholars to head various positions relating to the research and development of the weapon and what, ultimately, needed to be done to make incendiary bats a reality. The letter made its way from a senator friend of Adams, to Eleanor Roosevelt before finally being given to the President Franklin Roosevelt⁹¹. Roosevelt responded with a letter to both Adams and one Colonel William Donovan giving his tentative approval for the plan. The letter was no more than a few lines long and was enclosed in an envelope marked SECRET on the margin. It quite simply spelled out to Col. Donovan that Adams was indeed "not at nut" and that his plan was a "perfectly wild idea" that was deserving of some (but just some) attention.⁹² Adams would assemble a team of scientists, businessmen, filmmakers, and bat zoologists to get to work cracking the various problems with the proposal. First, they required a substantial supply of bats for both use and testing. Second, an incendiary device was required that would be light enough for the bats to carry and yet volatile enough to cause suitable damage. This problem was ultimately the most difficult to crack as currently the only incendiary available in the Department of Chemical Warfare's arsenal was white phosphorous which, despite burning at incredibly high temperatures, did not produce a very large burn radius nor was it easily detonated. Lastly, the Bat Bomb (as it was to be known) required a delivery canister inside of which the bats could be stored and released during an aircraft drop.

⁹⁰ Adams, Lytle S. Lytle S. Adams to Franklin D. Roosevelt, "Proposal for surprise attack: Remember Pearl Harbor", Irwin, PA, January 12, 1942.

⁹¹ Couffer, Jack. *Bat Bomb: World War II's Other Secret Weapon*. Austin: University of Texas Press, 1992. Pg. 5

⁹² Roosevelt, Franklin D.. Letter from Franklin D. Roosevelt to William J. Donovan. Washington D.C, January 1942.

The first problem was easily solved. The team behind the project searched thousands of caves around the Los Angeles area for a suitable supply of bats that were capable of being captured en masse and equipped to carry explosives.⁹³ By June of 1942, the locations of the best bat caves in the country were revealed by Emil Rugh, a Texan and the owner of a fertilizer business that happened to hold the leases on the largest of the caves. Rugh, who used bat guano for his fertilizer, was recruited personally by Doc Adams, and would solve the bat problem. The second issue with the Adams Plan was that of developing an explosive that was easier to detonate than white phosphorous yet still packed the same fiery punch. The difficulty with white phosphorous was that it required a large payload to do significant damage and a rather sizeable amount of explosive to set it off. Until now, WP or ‘Willy Pete’, as it was known, had its use limited to artillery and mortar shells, tank rounds specifically smoke generating ones, and grenades. Obviously, none of these were “bat-portable” and thus an alternative had to be created. Doc Adams would make various trips to the Chemical Warfare Headquarters in Aberdeen, Maryland while attempting to find a solution to this problem.

On June 12th 1942, Adams presented information based on the research of Louis F. Fieser, and William Young, both chemists working on the bat bomb, that suggested an entirely automatic combustion device and time delay. During the meeting the Doctor’s detractors argued that the effects of low altitude, cold, and antiaircraft fire would be detrimental to the bats. Adams refuted the claim, stating bats were accustomed to cold as hibernating creatures. The generals in the room excused him and accepted his statements for the time being. In an ironic twist of fates, while in Washington DC a few day later, Adams would present his plan to a general who had it confused with a different secret bomb idea. The general was enraged at

⁹³ Couffer, Pg. 26

Adams whom he thought was “the one promoting that crazy notion of making bombs out of atoms”.⁹⁴ Ultimately, Fieser, one of the chemists working on the project would create the solution to the bomb portion of the “bat bomb”. His device, jellied gasoline, or napalm, with its own igniter system weighed on 17.5 grams which was well within the 15 to 18 gram carrying capacity of the bats⁹⁵. Feiser had been on the team developing napalm, which used a combination of aluminum *naphthenate* and aluminum *palmitate* (Napalm) to jellify gasoline into an incendiary which was deemed adequate for the purposes of the Adams Plan and not as expensive, nor difficult to set off as white phosphorus. With the payload for the bats decided, the next hurdle that the Adams Plan had to overcome was delivery.

The plan had always been to airdrop the bats over Japan so that they might disperse and set forest fires, destroy buildings, and otherwise sow confusion amongst the Japanese populace. To accomplish this, at least the airdrop portion, the bats had to be made able to transport and loaded into a delivery device. The bombshell known as the Crosby canister shell after its designer, which consisted of a series of “egg crates” baffles containing bats, would be dropped from a B-25 bomber and, as measured by an altimeter switch, would deploy the bats by cracking open the bottom and springing out the “egg crates”.⁹⁶ When deployed, the “bomb” looked rather like a parachuting accordion.⁹⁷ The bats had to be chilled before being put into the “bomb”, as this would cause them to go into hibernation and thus make them more docile and easy to work with. Once the whole device was completed, the Air Corps and Chemical Warfare Service scheduled a demonstration for March 1943 at the Carlsbad Air Force Base in New Mexico.

⁹⁴ Couffer, Pg. 61

⁹⁵ Couffer, Pg. 89-90

⁹⁶ Couffer, Pg. 114

⁹⁷ Photo courtesy of U.S Air Force, found in Couffer.

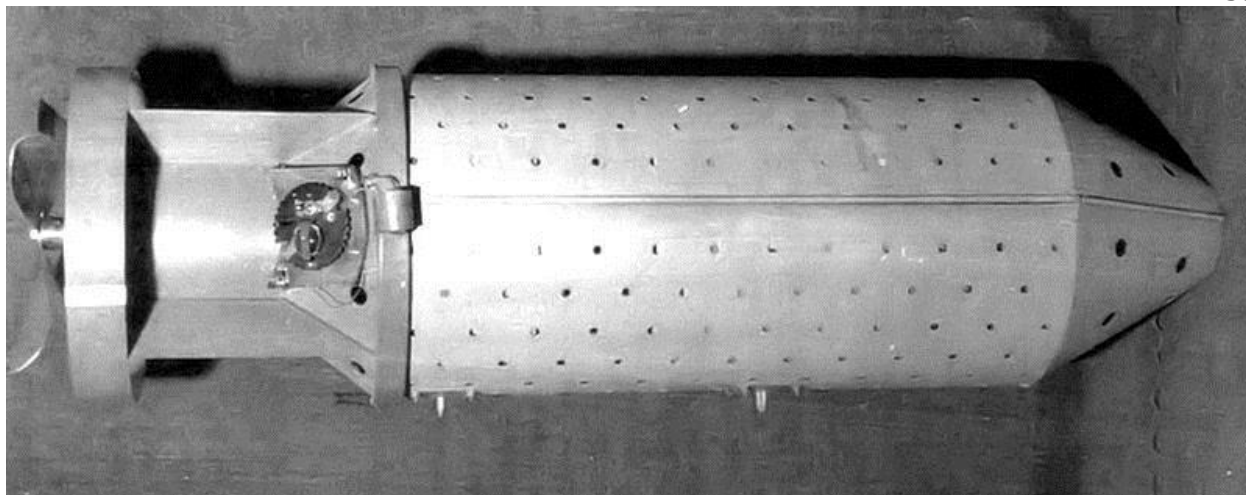


Figure 3

The Carlsbad test confirmed both Doctor Adams' hopes about his plan and the fears and trepidations of the Chemical Warfare Service. The bats and the “bomb” that were tested at Carlsbad functioned quite well, with the “bomb” itself deploying correctly and the bats (who for testing purposes were carrying fake payloads) dispersed exactly as intended.⁹⁸ The observers cheered the success of Adams' creation, while simultaneously lamenting having to collect all of the bats that had flown off. Unfortunately for the “Bat Bomb” and Adams' plan altogether, Carlsbad would also be their downfall. While testing the bats at the base, a few of the creatures, who were carrying armed incendiaries, escaped and took up residence in some of the surrounding hangers. The bats' charges ignited and burned down a few buildings and hangers at the base. Ultimately, this was to prove to be the final nail in the coffin of the “Bat Bomb”.

The weapon had been considered a bit of a wacky idea from the beginning and its detractors, especially those in the CWS and in Washington, shut it down. Its weirdness was not the sole reason for its cancellation. Jack Couffer, one of the men working on the project, would write about his experience on the project after its declassification after the war. He would say

⁹⁸ Couffer, Pg. 114-116

that the whole project was only possible because the U.S. was “grasping at any straw to save our country from extermination”.⁹⁹ Desperation and the desire for revenge (with a little help from Lytle Adams’ excellent connections) were what got the “Bat Bomb” approved in 1941 and by May of 1943 (when Carlsbad was accidentally scorched), with both of those motivations less and less pressing, the Plan was abandoned. There are few indications in either Couffer’s memoir or official evaluations of the Bat Bomb that show its cancellation came from its unusual quality. Rather, safety, and questions about its combat usefulness were what killed the project. The U.S. military was reluctant to continue funding a project that had managed to burn down its own testing facility. Additionally, as the war dragged on, the United States government chose more and more to focus its other secret projects, namely the Atomic Bomb, to win the war.

“New York in Flames”, Jet Planes and the *Amerika Bomber*: The German Example

Before the outbreak of the Second World War the German Luftwaffe recognized that it had a slight logistical problem due to Germany’s unique access to natural resources. Oil, the life blood of any army hoping to wage a lightning war, was far out of Germany’s reach. The vast majority of Europe’s oil reserves were located in the Ploiesti oil fields of Rumania.¹⁰⁰ The Luftwaffe recognized very early on that this scarce resource would dictate the terms of their operations in any future conflict. In order to make better use of scarce fuel prospects, the Luftwaffe proposed using a much smaller fleet than most contemporary air branches would consider practicable. To maintain their flying force’s lethality while still shrinking its size, Nazi researchers proposed a novel solution to the problem: jet aircraft.

During the interwar period, jet research had largely been undertaken by the Heinkel company, with very little government financing and only a handful of engineers. Heinkel

⁹⁹ Couffer, Pg. 231

¹⁰⁰ Western Axis Subcommittee. 1943. "Estimated Refinery Output in Axis Europe -- 1943" Enemy Oil Committee

recognized that current propeller driven designs were reaching their peak possible performance and turned to jets for more competitive designs. Heinkel, with little government interference or input, would produce their first flying jet craft in 1939 just before the start of the war.¹⁰¹ Jets fit soundly into the doctrine of *blitzkrieg* and the Luftwaffe would turn to these designs during the war. However, once war production became a state affair, the design freedom enjoyed by Heinkel would be replaced by central planning.

A jet propelled fleet would be capable of outrunning any current Allied prop-aircraft in production. This meant that German aircrafts could “shoot and scoot”—dealing as much damage as possible without giving the enemy time to retaliate. A small fleet of jets could theoretically have the same fighting capabilities of a much larger fleet of propeller driven craft. This would allow the Luftwaffe to maintain fighting efficacy without constantly having to produce aircraft.¹⁰² By 1942, with losses of conventional craft beginning to outpace production, jet aircraft were seen as an acceptable solution. Jets were still in their infancy at this time and were by no means conventional arms. They were still experimental. Many prototypes were downright dangerous; further testing and refining would be necessary before controlled jet flight could be militarized and effectively mass produced.

There were countless other German jet aircraft designs on paper at this time, each more outlandish and spectacular than the last. The culmination of these fantasy jets was the proposal by Hitler for the “Amerika Bomber”, an ultra-long range strategic bomber capable of hitting targets in the U.S. before returning to bases in Europe. According to Albert Speer, Hitler was

¹⁰¹ Corum, James. "A Clash of Military Cultures: German & French Approaches to Technology Between the World Wars." USAF School of Advanced Airpower Studies, 1994. Pg. 10

¹⁰² Schollars, Todd. "German Wonder Weapons: Degraded Production and Effectiveness." *Air Force Journal of Logistics* 34, no. 3/4 (2010) Pg. 64

always obsessed with the idea of a large city like New York “in flames”.¹⁰³ The maniacal idea, by virtue of Hitler’s extreme authority in the state, became policy. Designs were requested for a long range airframe with U.S. strike capabilities. The first designs put forward were massive propeller driven craft similar to the British and U.S.’s strategic bombers. These initial designs stemmed from pre-war creations including an ultra-long range reconnaissance craft the Me 261 V1&V2 (supposedly capable of traveling 13,000km in one go) and later the Me 264 a four-engine bomber. The latter of these craft was commissioned in March 1941 with the goal of conducting future “nuisance” raids against American cities. Ernst Udet, then Generalluftzeugmeister in charge of the Luftwaffe’s production arm, ordered 30 of these craft.¹⁰⁴ The Me 264 V1 was powered by four turboprop engines and future craft would have had a mix of props and jets. Ultimately neither project would come to fruition with the Me 261 being scrapped shortly after the outbreak of the war (it had been designed with the idea of taking the Olympic torch from Berlin to Tokyo in 1940 in mind) and the 264 V1 prototypes being destroyed completely in an Allied bombing raid in the summer of ’44.

The Amerika Bomber was not only conceived as a conventional, albeit enormous, prop-driven plane, it also existed in the minds of German engineers as a grand flying-wing style aircraft. Dubbed the “acme” of strategic bomber design by scholars, the Messerschmitt Me P 08.01 was a design for a quad-engine flying wing craft that could have done it all.¹⁰⁵ Even its designers understood that it was an utterly ridiculous concept in September of 1941 when its description was released.

¹⁰³ Speer, Albert. *Spandau: The Secret Diaries*. New York: Macmillan, 1976.

¹⁰⁴ Herwig, Dieter, and Heinz Rode. *Luftwaffe Secret Projects: Strategic Bombers 1935-1945*. English Language ed. Leicester: Midland Pub., 2000 Pg. 38-41

¹⁰⁵ Herwig and Rode, Pg. 49

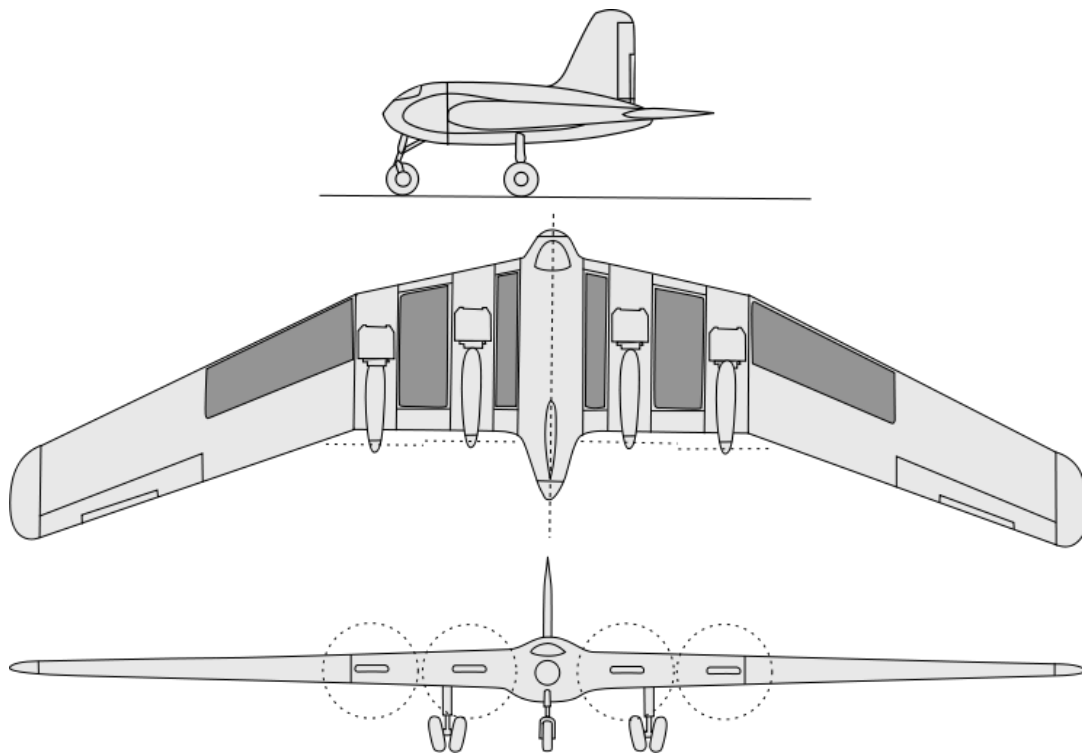


Figure 4

The flying wing would have been capable of quick refits and redesigns making it a suitable ultra-heavy long range bomber, an ultra-long ranged reconnaissance vehicle, a troop transport capable of carrying a 22-ton tank, or an airborne anti-aircraft platform carrying four 88mm flak guns. The flying-wing concept was particularly odd for the time, as this would have been the first project to ever incorporate such a design. Mock-up drawings were created, but ultimately the Me P08.01 stayed on the drawing board. Such projects were only ever tolerated and approved because of Hitler's closeness with Messerschmitt and his obsession with striking out across the Atlantic. Germany's shrinking prospects at waging an offensive war combined with a lack of resources meant that the Amerika Bomber would never leave the drawing board. Instead, designs for jet powered fighters and interceptors began to take precedence in the later years of the war. The flying wing design of the Me P08.01 would be recycled and used in the jet

powered Horton Ho 229 however, giving its prototypes the distinction of being the first pure flying-wing jet.¹⁰⁶ The flying-wing concept would be toyed with by the Americans, who captured the 229, after the war but a similar craft would not enter into service until the 1990s with the B2 Spirit.

For the Third Reich, jets offered a legitimate solution to the problems of resources, but also gave way to delusions of “fast-bombers” and the Amerika Bomber. Their unique strategic situation allowed for unrestricted research into such designs at the start of the war. Unfortunately for the Luftwaffe’s dreams of an all jet fleet, interference from on high pointed their efforts in totally different direction. Their early efforts to produce effective propulsion technologies were notable, but its future operational use was very much in question. Hitler and his Nazi High Command still maintained and ordered the design of strategic bombers despite the Reich’s rapidly deteriorating military situation. This schizophrenic manner of strategic planning would leave the Luftwaffe to scramble for intercept jets in the latter half of the war as the Allied air campaign reached its peak. Even then, Luftwaffe’s fight command would continue see their efforts to create jet fighters stymied by members of Nazi High Command who still clamored for an impractical airframe who global strike capabilities in mind.

Conclusion

The early innovations and forays into the weird of various countries were fueled and shaped by a variety of influences. First and foremost, outlandish and strange ideas were often adopted because they solved problems that otherwise had no other easily manufactured solutions at the time, like the Sticky Grenade. Others that saw substantial research and development during the early years of the war that had been toyed with during the interwar period and the

¹⁰⁶ Green, William. *The Warplanes of the Third Reich*. Garden City, N.Y.: Doubleday, 1970 Pg. 247

outbreak of war merely provided exigency for their development, like the Limpet and bomb guidance system. These weird weapons often started in a very rough or curious format before seeing extensive refinement later in the war or even post war. This is manifested by the various models of the Limpet (some of which are used today) and the re-expansion of research into bomb guidance with radar and animals during the 1950s (a direct result of Skinner's work). This indicates that, while a weapon may be too strange for use, its very research is important in the grand scheme of arms production. This theme will be extremely important in discussing the weapons, like the V2 rocket and atom bomb, which shall appear in the next chapter of this thesis because they were in their infancy during the Second World War and saw expanded use, and indeed, universal adoption during the Cold War.

On the other side of this we can see that some weapons developed out of desperation were technological dead ends. Weapons like the Bat Bomb or the "ice battleship" were from the outset seen as crackpot ideas that were going nowhere. Much of the time this assessment was spot on, however they sometimes produced interesting secondary arms (like napalm out of the Adams Plan). Weird arms often never had to see combat to provide a substantive effect on the war effort; if anything, they often told scientists and generals what *would not* work. The development of some of the arms discussed in this chapter also shows us how important a privileged actor could be when it came to overcoming the collective action problems necessary to further a project's work. Whether this came in the form of a powerful statesmen obsessed with weapons (like Churchill), a personal acquaintance (like Roosevelt's wife) or even a large private corporation (like General Mills), it was beneficial for a project to have an influential ally. The strange weapons of the early war were built with various goals in mind; whether it was something as simple as vanquishing tanks, to something as grand as getting revenge for Pearl

Harbor, all weapons had purpose no matter how nutty. These ideas were not judged as either good or bad from their outset, rather they were judged on their possible effectiveness, what resources they required, and their technological feasibility. When a project met the needs of its country, it could usually expect to be explored or even adopted. The strangeness of a weapon rarely decided the fate of a project. As demonstrated by many of the memoirs and writings of the people observing these arms, weirdness may have slowed some project's adoption, but rarely was it the sole cause of their cancellation. During wartime, weird ideas were seen as just as viable as conventional ones, so long as they performed their purpose.

Chapter 4

The End Game: 1943-45

In the last two years of the Second World War the weird war began to take on a new face. Desperation and last ditch efforts to end the war in an instant, or turn the tide in some major way, became more and more the norm. The reality was that the countries involved in the fighting saw their economies and populations stretched to the absolute limit. In Germany this meant turning more and more to slave labor to accomplish their production goals. Their old habit of being able to produce whatever arms that Hitler himself fancied was now limited by bombardment and stress. In the United States, war debts were being leaden on the wealthiest members of society and war bond drives traveled the country raising funds for weapons, food, ships, and planes. The brightest private minds in the country were coopted by the military to invent world changing weapons. For the United Kingdom, war weariness was setting in at the same time as the nation prepped to be the jumping off point for the inevitable invasion of the Continent. Great Britain's perpetual practicality, which had decided which arms saw success and others failure, continued till the end of the conflict. Weird ideas were still receiving attention in all three nations, however, especially after the fall of the Atlantic Wall on June 6, 1944, the minds of scientists turned to winning the war as quickly as possible, or, at least in the case of Germany, exacting a terrible price for every yard the Allies gained.

The weapons technologies that were developed and fielded in this period of the conflict (all those appearing in this section saw action in some form or another) were produced on either

of the extremes of technological necessity. They were either products of extremely focused research and development and meant to solve specific problems related to defeating or negating one side or the other's advantages, or were grand designs that looked to end the war in a flash or alter the future. Most were described by their creators as odd or weird or amazing in some manner or another, but the weapons developed at this time were not always mere flashes in the pan. While the cost effectiveness and actual influence on the World War II of weapons like jet aircraft and the atom bomb have been much debated, these arms would go on to define the next half-century. This is what the weird arms developed in this time period have in common. The ones that were fielded were further developed and perfected post-war free of desperation and when resources were no longer scarce. Whether or not the development or creation of these weapons was prudent will be touched on in this chapter in an effort to answer why they were approved.

Typically, most of the "wonder weapons" from each nation gained support because of the placement or charisma of their designers or because they simply fit the bill for the most effective design despite their oddball qualities. Some projects, despite seeming more practical than others, still found themselves tossed aside in favor of more fantastic ideas. This is illustrated best by the German's V-2 rocket program or the American atom bomb. They were also born of wartime stresses and necessity. Without the "total war" raging in Europe and across the Pacific, such cruel and crazy machinations may have remained fantasy. As stated before, the minds of inventors across all nations were unshackled by the world war. Their ideas were not seen as good or bad, instead, as viable or not viable. Many of the weapons of the latter half of the war were designed with "going big" in mind. They were proposed as war winners, wonder weapons,

and game changers. While not all arms that were produced during the late war fall into this category, some of the weirdest to ever see action did, and those will be covered in this section.

We must keep in mind, however, that while some of the most fantastic ideas of the Second World War were becoming realities, those nations involved in the fighting did not by any means cease improving on conventional designs. Rapid innovation still drove much of the war effort. Some of the most widely fielded, fearsome, and effective armored fighting vehicles of the war were designed in 1943 or beyond. Infantry small arms like the American M3 Grease Gun, or German StG 44 (Sturmgewehr 44 “assault rifle 44”) for example, did not see combat until the second half of the conflict. Aircraft designs, such as the American B-29 Superfortress that deployed both atomic bombs did not see service until 1944. German weapons production during the latter half of the war actually *increased* despite Allied bombing raids on most major production centers.¹⁰⁷ Albert Speer’s exceptional organizational skills and the wide use of slave labor are often credited with this success. The United States too, by this time fully mobilized in the Clausewitz-ian idea of total war, were producing aircraft, tanks, rifles, and bullets in great quantities. The British too worked towards ensuring a successful invasion of France in the summer of 1944. All told, the war, to those involved, was not winding down; rather it was advancing along at a steady rate, with victory a very real prospect for either side. The weirdest weapons to be fielded at this time were ones that their designers hoped to turn the tide in their favor.

First the weird weapons developed by the British, including those that came out of the Department of Miscellaneous Weapons Development, will be discussed. The British habit of producing purpose designed weapons, this time with the intent of breaching the Atlantic Wall,

¹⁰⁷ Speer, Albert, Richard Winston, and Clara Winston. *Inside the Third Reich: Memoirs*. New York, New York, 1970. Pg. 213

continued into the latter half of the war. These devices include the rocket-propelled death wheel called The Great Panjandrum and the beach clearing Hobart's Funnies. These weird weapons are, again, examples of how ingenuity and out-of-the box thinking were trademarks of the British arms development programs and provide an example of how necessary trial and error was. They are still built with very practical applications in mind though. Both provide examples of how British designs that found success were typically those that were very firmly rooted in the realm of existing possibility. The failures of past amphibious landings, like Dieppe, also heavily influenced Great Britain in its decisions of which project to field. As was the case in the early war, future success meant taking the lessons of the past and applying new, ingenious solutions to them.

The Luftwaffe underwent severe changes during the final years of the war, including some that broke unknown grounds. The first appearance of jet planes in combat were German interceptors. The process to field these new miracle weapons was difficult because of both meddling from above, and material shortages caused by the war. This chapter will also discuss the rift between Albert Speer and other high ranking members of the Nazi Party when it came to war production and the V2 program. Wernher von Braun was one of the great influences on the Nazi High Command's decision to back the production of long range surface to surface rockets. The difficulties posed by the entangling Nazi bureaucracy heavily influenced the development and production of these weapons of revenge. The German "Wonder Weapons" will be the focus of this chapter as they effectively exemplify the desperate nature of Germany's final stand, but also serve as an example of how forward-looking scientists would influence the future of war with their creations.

The final section of this chapter will focus on the American Manhattan Project, and the lesser known Operation Paperclip. Atomic weapons may not seem so strange today, but they were looked at as utter anomalies at the time of their creation. The public simply could not decide what the Atom Bomb would mean. The ultimate terror weapon, designed by the brightest individuals of the United States, was to be analyzed, critiqued, and mused over almost immediately following its use. The Atom Bomb was a weapon of great fear, enough to force an enemy as committed as Japan to capitulate, but also one of great hope. While questions about what “the bomb” meant swirled around in their time, so too did the secrecy that surrounded it and other projects. One of these, Operation Paperclip, an immediate post-war project, remained a secret until very recently. The Operation was the result of careful planning by the Allies and sets the stage for the arms races of the Cold War as much as the bombing of Hiroshima and Nagasaki did. Both of these grand schemes would not only alter how the war was fought and ended, but the very face of international relations for the following half-century.

“Till the Gunpowder Ran Out at their Heels” Breaching the Atlantic Wall: The British Example

For the British in the final years of the war, experimental weapons were directed at breaching the Atlantic Wall. The Wall, a set of strategic coastal defenses stretching across the French coast of the British Channel, was constructed under Field Marshall Erwin Rommel. Rommel believed his defenses unbreakable. Concrete bunkers, beach obstacles, and massive coastal gun emplacements would all have to be overcome in the coming invasion. With this goal in mind, British arms designers and engineers would go on to create some of the oddest weapons of the war. The hard lessons learned during the disastrous Dieppe raid of August 1942 were in the front of the minds of British arms researchers when they designed weapons with amphibious

assault in mind. The Raid, a proposed assault on the continent on France's northern coast, involved various British Commando units, Canadian infantry forces, and air and sea components, was a catastrophic failure. The Allied forces were pushed back into the sea in a mere five hours after getting hung up on the beachhead.¹⁰⁸ One of the failures of the Dieppe raid was the lack of armored vehicles that made it into fighting positions on the beach before being destroyed. The raid resulted in over 60% casualties for the attacking (mostly Canadian) force and showed Allied planners that a successful invasion of France was a long time off. The problems that were encountered at Dieppe, the density of the German defenses, were their prime concern and obstacle.¹⁰⁹ The goal of British Armored commanders and arms researchers before the inevitable repeat invasion of France (Operation Overlord) then was to learn from their mistakes and succeed in their objectives. Learning from the failed Dieppe Raid, the British had to overcome the various problems that amphibious assault presented. The first problem to be addressed was the issue of getting armored vehicles onto the beach without jeopardizing landing craft. During the raid, LST (Landing Ship, Tank) were forced to pull directly onto the beach to unload their cargo, exposing them to German guns and artillery. As a result, 33 were destroyed by enemy fire, and the infantry, unsupported by tanks, were cut to pieces on the steep beach.¹¹⁰ Secondly, the Dieppe Raid indicated the necessity and possible usefulness of dedicated engineer vehicles. Bunkers, anti-tank ditches, and steel obstacles dotted the French coast and were integral to the Atlantic Walls defenses, these would need to be destroyed or rendered useless in any future

¹⁰⁸ Neillands, Robin. *The Dieppe Raid: The Story of the Disastrous 1942 Expedition*. Bloomington: Indiana University Press, 2005. Pg. 248

¹⁰⁹ Hamilton, Nigel. "Dieppe." In *Monty - The Making of a General*. New York: McGraw-Hill, 1981. Pg. 546-558

¹¹⁰ the Earl Mountbatten, of Burma. 1974. Operation jubilee: The place of the dieppe raid in history. *RUSI* 119, (1) (Mar 01): 25. Pg. 26

attacks. The naval bombardment at Dieppe was not effective enough at disabling these coastal installations and showed Allied planners that close support engineering vehicles were needed.¹¹¹

The weapons systems that the British developed to address the hard learned lessons of Dieppe were very much in the same vein of their previous endeavors. First and foremost, the solutions that were created to address this problem were distinctly wartime developments. They also are excellent examples of how the British preferred practical developments to address specific problems. Neither natural resources nor manpower were in great abundance in the country that had been fighting since 1939, and the weird weapons developed in the late years of the war reflect this. Both weapons systems that were proposed to breach the Atlantic Wall proposed to help mitigate manpower losses by either protecting the individual soldiers, or taking them out of the equation entirely. The most bizarre method came in the rocket propelled, explosive laden, “Panjandrum”.

The “Great Panjandrum” was one of the most spectacular failures of engineering during the Second World War. The device itself, created by the Admiralty’s Directorate of Miscellaneous Weapons Development (DMWD) known as the Wheezers and Dodgers (the Naval equivalent of the MIR c), was designed with breaching the 7 foot thick concrete walls of the Atlantic defenses in mind. The explosive payload required to do so was calculated at over 1,000 lbs by researcher Sub-Lieutenant Nevil Shute. Shute proposed using a cordite-rocket-propelled-wheeled carriage to carry a payload of that size up the beach and into the defenses. Shute was well known for his rocket work and the project was greenlighted for testing.¹¹² Had it not been for Shute’s notoriety and success with rocket propulsion, the Panjandrum might never

¹¹¹ Stacey, Colonel C.P. "The Lessons of Dieppe." *Report No. 128: The Lessons of Dieppe and their Influence on the Operation Overlord*. Ottawa, Canada: Department of National Defence Canadian Forces, 1944. Pg. 2-3

¹¹² Terrell, Edward. *Admiralty Brief; the Story of Inventions That Contributed to Victory in the Battle of the Atlantic*. London: Harrap, 1958. Pg. 98-99

have seen the light of day. The end product, which consisted of a 4000 lb explosive filled drum with two 10 foot diameter fixed wheels, was named by Shute for Samuel Foote's famous nonsense poem which mentions the "great Panjandrum"; particular reference was paid to the last line "till the gunpowder ran out at the heels of their boots".¹¹³

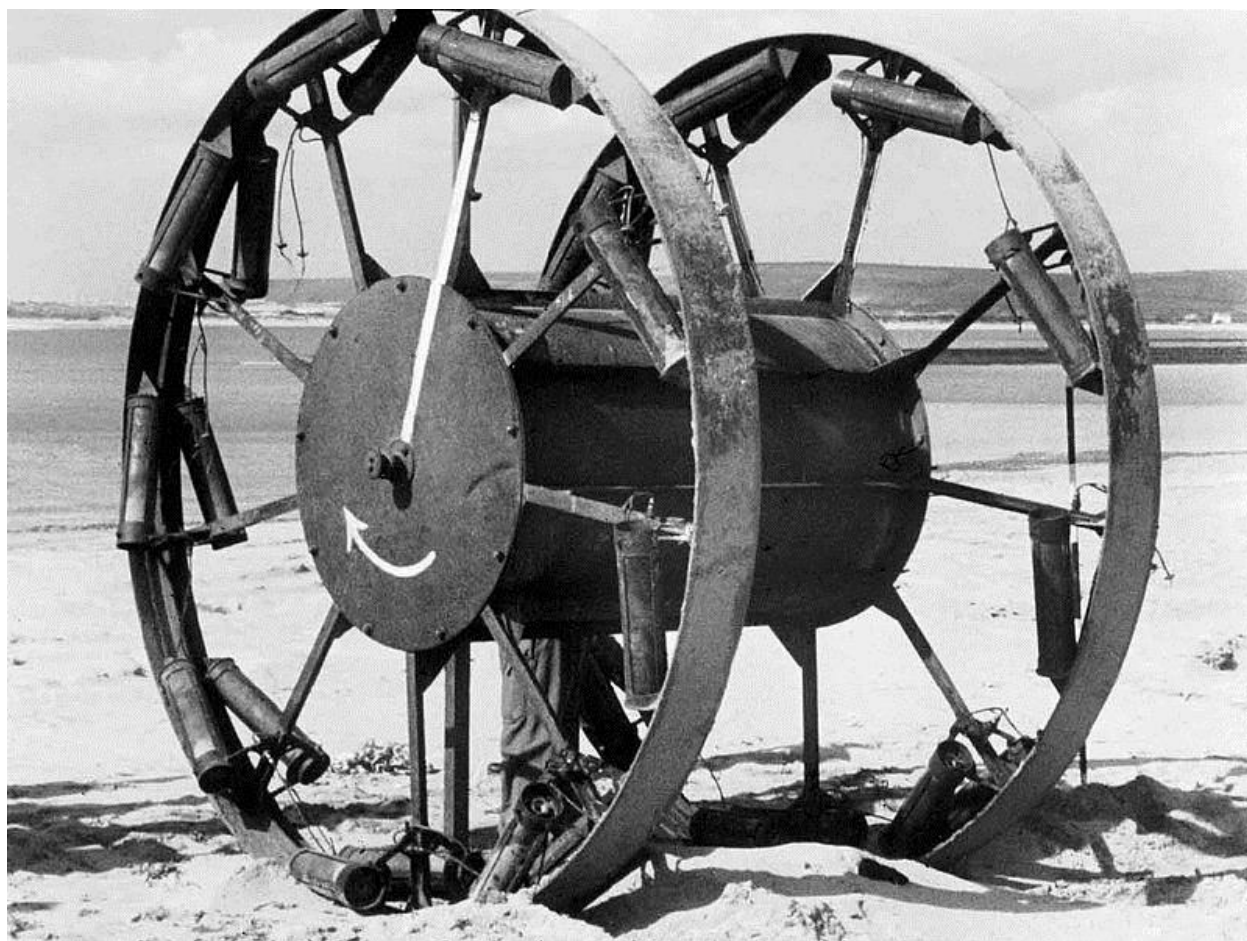


Figure 5

The device was tested and filmed at the Combined Operations Experimental Establishment (COXE) in Westward Ho, Devon in 1943 first, then in 1944 as the invasion loomed.¹¹⁴ The film of the device shows some rather flamboyant success. The wheel tumbled

¹¹³ Foote, Samuel, and Randolph Caldecott. *The Great Panjandrum Himself*. London: George Routledge & Sons, 1885.

¹¹⁴ Johnson, Brian. "The Great Panjandrum and Other Stories." In *The Secret War*. New York: Methuen, 1978.

and blasted forward propelled by its cordite rockets with frightened beachgoers looking on in amazement.¹¹⁵ Ultimately however, following many tests with more explosives, less explosives, more rockets, bigger wheels, and the like, the “Great Panjandrum” was shut down by the Wheezers and Dodgers out of fear of one getting loose on a landing craft and detonating. The Panjandrum was too unstable a development to ever make it further than testing. The practical minded Brits would seek a better solution to the Atlantic Wall problem. The solutions, and there were many, came from Major General Percy Hobart and the 79th Armored Division.

The problems associated with negotiating the beach with armored vehicles and providing close support to attacking infantry would be addressed by Major General Hobart’s “Funnies” or AVREs (Armored Vehicle, Royal Engineers). The “Funnies”, a series of tanks (mostly of M4A1 Sherman or Churchill pattern) modified for use by engineers included mine destroying flail tanks, palisade/fascine carrying vehicles, “bobbin” tanks, flamethrower tanks, and bridge laying tanks. The vehicles used by the 79th (and distributed to other units) are the first examples of dedicated engineering AFVs (armored fighting vehicles) and as such were described as being “funny”.¹¹⁶ All were heavily modified versions of existing tanks, but often after the modifications, were unrecognizable. The “funnies” sported massive hydraulic superstructures, strangely shaped guns (not guns at all, but gigantic spigot mortars), and even bridges. They looked almost nothing like their standard counterparts and thus drew attention as being tanks, albeit a bit, “funny”. The “funnies” were developed with each vehicle being specialized to some degree or another. A few of these designs, the Sherman Crab with its rotating chain-flail drum in particular, were used by both the British and Americans.¹¹⁷ Their novel design made them well

¹¹⁵ *Trials of "The Great Panjandrum"* United Kingdom: Imperial War Museum, 1943. Film.

¹¹⁶ Heydt, Bruce. "Funnies Versus the Atlantic Wall." *British Heritage*, January 1, 2004, 51-55.

¹¹⁷ *War Dept Film Bulletin 156: The Engineer Armored Vehicle*. United States: U.S War Dept., 1944. Film.

suited to clearing mine fields with minimal risk to the operators. Other designs, like the “bobbin” were strictly used by British forces during the Invasion of Normandy. This “funny” carried a large bobbin of heavy sheet cloth in front of the vehicle that laid out a carpet of sorts over soft sand. This carpet increased the surface area over which the tank drove and prevented it (along with other tanks following it up the magic carpet) from getting bogged down.¹¹⁸ Other AVREs were designed with bunker busting in mind. These mounted the 40lb “flying dustbin” spigot mortars and room for engineers to stay protected inside the vehicle.¹¹⁹ The “fascine” carrying tank was typically a Churchill AVRE carrying a large bundle of logs that could be dropped remotely into a gap or ditch to create a simple bridge which other vehicles may cross. “Funnies” were such an oddity that only the “Crab” and the swimming DD tank would be adopted by units other than the 79th. The most famous of Hobart’s “Funnies,” the swimming tank, was used on all of the beaches of Normandy.

The duplex drive (DD) Sherman M4 was the most ubiquitous of the “funnies.” The DD was a modified Sherman tank that, using a buoyant cloth screen and twin propellers attached to the engine shaft, could swim its way on to a beach from either a landing craft or landing ship. They were used by both the British and Americans, with sometimes mixed results. Some observers would attribute great success to the odd amphibious tank, but others concluded differently.¹²⁰ The DD in the water, with its canvas screens raised, looked not unlike an infantry raft, and presented a rather small target. On the beach, the DD dropped its screens and provided

¹¹⁸ *Churchill AVRE with a "bobbin"* United Kingdom: War Office, Imperial War Museum Collections, 1944. Photo

¹¹⁹ Borthwick, J.T., and Bernard Montgomery. *The Story of 79th Armoured Division*, October 1942-June 1945. Hamburg: 79th Armoured Division, 1945. Pg. 15-17

¹²⁰ Britain's "swimming tanks". 1945. *Marine Corps Gazette* (pre-1994) 29, (12) (12): 50, - This article attributes the saving of many lives (“at least 10,000”) to the DD Tank, whereas Borthwick and Montgomery are more realistic, describing “Crab” tanks fulfilling the role of the DD more often than not, Pgs. 34-35

immediate fire support for the troops coming ashore. They were designed to prevent a fiasco like Dieppe from occurring again.

The designs produced by the British during this time focused on cracking the Atlantic Wall and were products of the lessons learned during the failed Dieppe Raid. Hobart's "Funnies" were the product of a few very resourceful engineers and precious experiences and experiments with tank modifications (the "Crab" flail was first used during the North African Campaign). All of the modifications that made the "funnies" funny were extensively tested on English beaches before ever making the journey across the Channel. Those designs found unsuitable were thrown out. They were proposed and used to solve specific sets of problems associated with assaulting Europe, but their use did not stop at the beach. Unlike the Panjandrum whose use would have stopped after June 6th, the "funnies" were fighting vehicles with practical long term applications in mind. The specialty bridge layers and mine clearing vehicles were still a necessity as the Allies moved inland, as were the general purpose ARVEs. Alternatively, Great Panjandrum is an excellent example of how during the desperate preparations to re-invade Europe, minds within the British military complex were allowed substantial resources and a certain degree of leniency when it came to nonsensical solutions to the problem. The Panjandrum may have actually worked, the films of its testing at Westward Ho show as much, but it was written off as a viable weapon for safety concerns and because its use ended at the beach.¹²¹

As was very much the case with the British designs produced early in the war, those that were made with invading Europe in mind had to be practical in order to succeed. Hobart's Funnies saw success because they were more practical, that is to say versatile and proven, arms

¹²¹ *Trials of "The Great Panjandrum"* United Kingdom: Imperial War Museum, 1943. Film.

than the Great Panjandrum, an otherwise untested, unknown (possibly unsafe) development. The Funnies saw much approval because they were really just modifications to existing vehicles. The Panjandrum was never approved to be fielded out of safety concerns. The fact that it made it to the testing grounds at Westward Ho to frighten vacationing tourists was itself a testament to the influence of its designers and the fear of repeating a Dieppe Raid.

“Wonder Weapons”, von Braun, and Emergency Measures: The German Example

Germany in the latter half of the Second World War was on the back foot. The Soviets had stymied Nazi attempts to advance at Stalingrad, the United States and British Forces were beginning to push out of Africa and Sicily and into Italy proper, and daylight bombing raids by the American 8th Air Force were beginning to pick up. In the last two and a half years of the war however, the Germans would create some of the most world changing weapons out of sheer desperation and in total disregard to their dire economic position. By this time, Albert Speer had been placed in charge of the Ministry of Armaments for about a year following the death of Dr. Fritz Todt, the previous holder of the office, and was rapidly working to bail out a sinking ship.

High ranking Nazi officials continued to have an exemplary influence on the development of new arms. Speer, Hitler, and Himmler exerted pressure on designers and production facilities. Speer reorganized the Arms Ministry and attempted to promote projects that focused on fighting the enemy tactically, rather than striking on strategic targets like civilians or population centers. Heinrich Himmler, in charge of the SS, endeavored to keep as many projects for the SS as possible; ultimately they took over the production of the V2 rocket, using slave labor to make it possible. Hitler continued to meddle in the affairs of arms production, much to the consternation of Speer. The higher ups of the German state were only

able to influence arms development so much by virtue of the centralized, yet bureaucratic Nazi state.

By 1944 the realities of an extended war and the successes of the Allied air campaign had begun to show. Fuel shortages were crippling not only the Luftwaffe, but also the troops and tanks of the Wehrmacht. The lack of gasoline had brought the German military to a virtual standstill. Additionally, raids against the German ball-bearing facilities across Germany slowed the already wounded armaments production industry.¹²² Speer worked to turn the arms production towards conventional weapons wherever possible, but unfortunate mismanaging of the weapons produced often led to waste.¹²³ Hitler himself oversaw many of the weapons designs that would see use during the war, including some of the heaviest tanks, like the Tiger and Tiger “King Tiger” II, fielded by the Wehrmacht during the war. Hitler, Speer says, prided himself in possessing technical knowledge of all sorts of weapons systems, guns, and aircraft in addition to surrounding himself with various experts and consultants. However, Hitler was still wary of projects that did not mesh well with his Great War style of thinking. The rocket, jet airplane, and the atom bomb were, according to Speer, beyond his grasp.¹²⁴ Speer, on the other hand, along with visionaries like von Braun, worked to not only to stem the Allied tide rapidly rushing in their direction, but also to make a future of themselves. However, it has been argued that as Speer took over as head of the Armaments Ministry, scientists took a back seat to production as the war turned for the worse. Some post-war historians argue that he “prostituted science” for the sake of short sighted projects that any scientist could tell would be doomed to

¹²² Speer, Pg. 283-85

¹²³ Speer, Pg. 399 – new production Panther tanks wasted on green troops on the Western Front.

¹²⁴ Speer, Pg. 232

failure.¹²⁵ Speer argues in his memoirs that his efforts to advance rocket technologies (he called the V2 a “technical miracle” in 1942), were genuine, albeit, by 1944, he realized, misguided.¹²⁶

Weird weapons came to play with Speer directly when he was pulled between rocket projects by the SS. Foremost amongst these was the V2 rocket, a longer ranged, faster alternative to the V1 buzz bomb. The V2 rocket developed under the Peenemünde Army Research Center, *Fernrakete Aggregat-4* (Long-Range Rocket A-4, dubbed the V-2 by the Propaganda Ministry) was the product of years of research by notable Nazi rocket scientists like von Braun and was actually the amalgamation of two separate projects.¹²⁷ The first was the base rocket weapon, the A-4, a large single stage rocket with an explosive payload.¹²⁸ This was combined with a complex radio guidance system pulled from the Wasserfall surface to air rocket program. The whole rocket was propelled by liquid oxygen and solid methyl-alcohol fuel.¹²⁹ The weapon was greenlit by Hitler himself because it allowed for direct strikes against Allied cities as a foolproof alternative to the V1 buzz bombs.

The buzz bomb was the first rocket powered long range strike vehicle that the Germans had used against British and American targets in England and France, but their performance was far from perfect. The V-1 required a ski-ramp-type sled launching system and traveled at a slow enough rates (the V-1 was powered by a pulsejet engine) that Allied anti-aircraft and intercept fighters could knock them out of the sky before they reached their targets.¹³⁰ The Allied pilots and AA-gunners of Operation Crossbow (the system of V-1 defenses in England) called the

¹²⁵ Col. Simon, Leslie E. *German Research in WWII: An Analysis of the Conduct of Research*. New York: John Wiley & Sons, 1947.

¹²⁶ Speer, Pg. 367

¹²⁷ McGovern, James. *Crossbow and Overcast*. New York: W. Morrow, 1964. Pg. 43

¹²⁸ Jones, R. V. *Most Secret War*. London: Hamilton, 1978. Pg. 431

¹²⁹ Schollars, Todd J. 2010. German wonder weapons: Degraded production and effectiveness. *Air Force Journal of Logistics* 34, (3/4): 60. Pg 61-62

¹³⁰ McGovern, Pg. 63

flying bombs “doodlebugs” because of the pulsing sound that emanated from its engine. The buzz bombs were less than effective because of how slow they traveled, around 400 miles per hour, how loud they were, buzz bombs could be heard nearly 10 miles away in the air and sounded like “a Model T Ford going up a hill”, allowing areas to be evacuated before being struck.¹³¹ The V-1 was a known quantity to the Allies after the first was launched in the week following the invasion of France; the V-2 was a different story.

The newer V-2, or A-4 as it was continually known by its inventors, differed from the V-1 greatly because it was a supersonic missile and was still a secret when the Allies were pushing into France. The rocket was kept in utter secret by the Nazi High Command through efforts by Himmler to make sure that only slave labor was used in V-2 production.¹³² This way, production and deployment of the weapon were kept within the leak-proof SS structure. Hitler approved of the plan because, in his mind, it would allow Germany to strike back against England for all of the bombing raids. After first observing the A-4 rocket in testing he demanded that Speer put production to levels equal of tank production.¹³³ Hitler saw the rocket as the defining weapon of the war, something that would turn the tide and allow return strikes against the Allies with little cost and no opportunity for retaliation. The “technical marvel” that Wernher von Braun had created, however, was not going to change the war. The V-2 program was hardly the tide turning, secret marvel that Hitler and the Nazi High Command hoped for, and rather, it was a program that drew valuable resources from conventional weapons. The “5,000 in one blow” that Hitler had hoped for would never come to pass.¹³⁴ Even had this absurd number (five months’ worth of production) been achieved for a single launch, the total payload delivered would have

¹³¹ McGovern, Pg. 60

¹³² Speer, Pg. 369

¹³³ Speer, Pg. 368

¹³⁴ *Führerprotokoll*, October 13-14, 1942, Point 25

only been 3,750 tons of explosives; compare that to a single combined American and British air attack payload of over 8,000 tons.¹³⁵ The V-2 would be used in strikes against London, Antwerp, and Liege, with only 3,000 rockets launched. This fell far short of Hitler's goals and goes to show how ineffective the project was. The alternative project that utilized the same basic rocket components, and was advocated by Speer, was Project Wasserfall (Waterfall).

This project was ideally conceived as Germany's counter to the Allied air bombing campaign itself. Wasserfall involved creating thousands of short ranged, semi-guided rockets, known as C-2 rockets, that were much smaller than the A-4, about 25 feet long and carrying only 660lbs of explosives, to be launched against bomber formations. The rocket would ride a directional beam up to fifty thousand feet and was expected to be able to hit bombers with accuracy. The rocket, in the eyes of Professor C. Krauch, the commissioner of chemical production, would have meant "the difference between victory and defeat".¹³⁶ Wasserfall did not receive near as much attention from notable figures like Hitler or Himmler and thus was mothballed in favor of revenge projects like the V-2. Speer, in his memoirs, claims that this smaller, cheaper rocket, and jet aircraft, the Allie's strategic bombers would have been beaten back.¹³⁷ The alternative to the rocket for beating back the Allie's bombers were ultra-fast, jet propelled interceptor craft.

The beginning of jet development in Nazi Germany has been mentioned in the previous chapter of this thesis, but beginning in late 1943, real leaps and bounds in creating a jet fighter and jet bombers were made. Unfortunately for those designing the aircraft and just like in the case of Germany's rocket program, Hitler's whims and capriciousness would affect how the jet

¹³⁵ Speer, Pg. 367

¹³⁶ Memorandum from Krauch to Speer, 29 June 1943, quoted in Speer 1970, Pg. 365

¹³⁷ Speer, Pg. 366

was developed and used. Speer has repeatedly stated in his memoirs that Hitler possessed a single minded, bullheaded-ness when it came to getting his way with weapons design, and that that stubbornness was defined by his World War I mind. He, Speer states, was narrowly restricted by the “traditional weapons of the army and navy” and as a result, the jet fighter (and projects like it) suffered.¹³⁸ The jet planes that would ultimately see approval and use by the Germans during the war included the dual engine Messerschmitt Me 262, the Messerschmitt Me 163B a single engine intercept fighter, and the prototype Raketenjäger “Natter” vertical take-off rocket plane. The first two designs saw use against Allied bomber formations starting in the fall of 1944, with the Me 262 being more effective due to its long range and heavy armament. The Me 163B was a terrifying new development for Allied aircrews. They first encountered them over Leipzig in late August, but their incredibly short range (25 or so miles) limited their combat usefulness.¹³⁹

The Me 262 with its two engines, on the other hand, had far greater performance than any other designs (including Allied propeller driven craft). It may have actually had a great effect on the Allied air war over Europe had there been enough built and enough fuel to keep a fair sized fleet active.¹⁴⁰ Unfortunately for the German war effort, they possessed neither of these. The jets that were produced in time to be used were incredibly impressive though, and certainly considered an oddity by those that used them. Luftwaffe fighter commander, General Adolf Galland in describing his first flight in a Me 262, said that it “felt as if an angel was pushing”.¹⁴¹

¹³⁸ Speer, Pg. 232-233

¹³⁹ Herwig, Dieter, and Heinz Rode. *Luftwaffe Secret Projects: Ground Attack & Special Purpose Aircraft*. Hinckley, England: Midland Pub., 2003. Pg. 201-202

¹⁴⁰ Simon, 178-179

¹⁴¹ Galland, Adolf, *The First and the Last: The Rise and Fall of the German Fighter Forces, 1938-1945*. New York: Holt, 1954.

However, wonder weapon as it was, the Me 262 received the worst sort of attention from Hitler who saw it as another potential weapon of revenge: a super-fast bomber.

The resulting clash between Hitler and Luftwaffe fighter command provides the best example of how meddling from on high hobbled the German war machine. The Me 262 was from the beginning designed with intercept and counter-bomber operations in mind; put simply, it was a purpose built fighter.¹⁴² Erhard Milch, head of Luftwaffe production, would be rankled by the idea of his jet fighter being turned into a fast bomber, but he still accepted the order. Ultimately, the interference caused even more delays, and in a fit of rage, Milch would say of the 262 “even an infant could see it was fighter!”¹⁴³ Hitler fired him just two weeks later. The Me 262 would eventually be used in its original fighter role (much to the despair of Allied air crews) but only after much lobbying from Speer and Goering.¹⁴⁴ The third jet aircraft that must be discussed is probably the oddest of the bunch: the “Natter”.

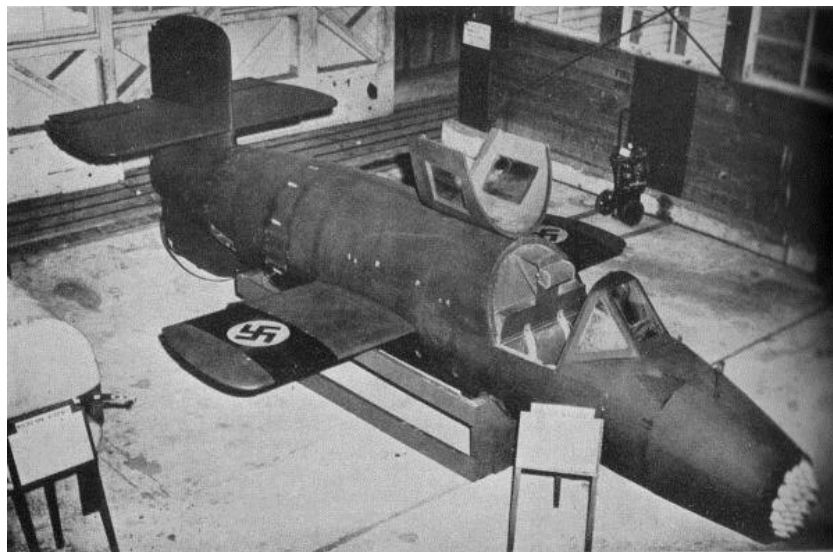


Figure 6

¹⁴² Schollars, Pg. 63

¹⁴³ Irving, David John Cawdell. *The Rise and Fall of the Luftwaffe: The Life of Field Marshal Erhard Milch*. Boston, Mass.: Little, Brown, 1974. Pg. 281

¹⁴⁴ Speer, Pg. 361-363 and Giffard, H. "Engines of Desperation: Jet Engines, Production and New Weapons in the Third Reich." *Journal of Contemporary History*: 821-44. Pg. 825

The “Natter” (Bachem Ba 349) was a point-defense rocket aircraft whose use would have been similar to the Wasserfall rocket. The craft was a manned, VTO (vertical take-off) rocket which carried a battery of 24 R4M air-to-air rockets in the nosecone. The intent was for the Natter to blast off, aim itself in the direction of a bomber formation, loose its payload, and then ram whatever plane it could as the pilot and jet engine parachuted to safety. The goal of this two part ejection was to save pilots and the complex and difficult to build rocket power plant both of which were in short supply.¹⁴⁵ The body of the Natter was itself rather simple and (in theory) would have required almost no training to fly. In postwar reports about their effectiveness, the Director of the U.S. Army’s Ballistic Research Laboratories Colonel Leslie E. Simon described the R4M as “freakish” in its effectiveness and design.¹⁴⁶

The Natter, conversely, was not nearly as effective as its armament. It was designed as a part of a program of disposability. The Natter was never intended as a legitimate part of the Luftwaffe’s fighter fleet. Rather it, much like the single shot *panzerfaust* anti-tank weapon, was a throw-away, point defense weapon of desperation. It was designed and tested in the last months of the war with its only manned flight occurring on March 1, 1945 (when things were looking bleak for Nazi Germany and as their economy was at the brink of collapse). The Natter is described only briefly in Speer’s memoir as a project for which Himmler assembled a “suicide squad” of pilots.¹⁴⁷ Only a handful of prototypes were created and there was only one manned test flight which resulted in the death of the pilot, Lothar Sieber.¹⁴⁸ Sieber was the first man to successfully pilot a manned rocket craft and, because of the Natter’s raw design, the feat cost him his life. The Natter was ultimately a last ditch effort by the German Luftwaffe to retaliate

¹⁴⁵ Schollars, Pg. 61-62

¹⁴⁶ Simon, Pg. 126, 179

¹⁴⁷ Speer, Pg. 412

¹⁴⁸ Herwig, and Rode, Pg. 193-194

against the Allied bombers that darkened German skies in raids of thousands. It was an unconventional craft and the result of economic desperation and dubious science.

Ultimately, Germany's rocket and jet programs were doomed to failure from the start. The original scheme of converting the Luftwaffe fighter fleet to an entirely jet based one to save costs while maintaining effectiveness never came to pass. Rockets were successful as a fear weapon, with buzz bombs striking civilian targets in England with regularity after the invasion.¹⁴⁹ But, as a tactically sound arm of the German military, they hardly lived up to their expectations. Neither was produced in enough quantity to have any substantial effect on the outcome of the war. This can be attributed to hundreds of factors ranging from delays stemming from the Nazi bureaucracy, to lack of raw materials, to the mere fact that the war delayed most projects. Scientific marvels on the cutting edge required extensive testing before being fielded; heavier tanks and cannons less so. Both rocket and the jet, however, would shape the Cold War to come. Naturally though, both required and would receive considerable refinements before most countries adopted them, but Germany's research, especially their rocket work, was a goldmine for Allied and Soviet militaries. The scientists who worked on these projects would find themselves the target of a series of operations created by both the U.S. and U.S.S.R in the last days of the Third Reich. The free rein to build and test, on live human subjects, weapons of terror gave Nazi scientists a highly marketable set of skills. During the peace that followed Germany's fall, its research would become invaluable.

¹⁴⁹ Ike visits Bradley Hq. as robot bomb goes by. 1944. *Chicago Daily Tribune* (1923-1963), Dec 03, 1944 - This is just a sample of the news coverage afforded to buzz bombs and rockets

Becoming Death, the Atom Bomb and Operation Paperclip: The U.S. Example

In August 1945 the Second World War became the world's first nuclear war. Two atomic bombs were dropped over Hiroshima (on the 6th) and Nagasaki (on the 9th) vaporizing the cities and killing thousands. The flashes from the blasts could be seen from hundreds of miles and the electromagnetic pulse generated reached as far as Hawaii. Newspapers across the United States exploded with news of the new "Atom Bomb" and how it destroyed an entire city. The project that had taken years of utter and complete secrecy to complete was now known to the world. The Atom Bomb was a shock weapon; it had never been seen before and it was entirely terrifying to behold.¹⁵⁰ The weapon cost millions of dollars and countless man-hours to create and was now completely out in the open. Speculators and editors across the U.S. rushed to explain the meaning of this grand new bomb. In the months and years that followed, professors and military men would weigh in as much as the newsmen. Some wrote it off as a "new toy" for the military.¹⁵¹ Others warned against putting too much stock in the weapon, calling it the new "Maginot line".¹⁵² Others still, with abject fear coloring their writing, urged for a "world state" as no single nation could stand against this terrifying new weapon.¹⁵³ The hope and excitement generated by the new bomb was almost as great as the fear that it caused. The "mighty atom" had crushed two cities in four days and the Japanese were talking about surrender.¹⁵⁴ But it was not the dropping of the bombs themselves that ended the Second World War; no, instead it was the *dread* of more being dropped.¹⁵⁵

¹⁵⁰ Gordin, Michael D. *Five Days in August: How World War II Became a Nuclear War*. Princeton, N.J.: Princeton University Press, 2007. Pg. 16-18

¹⁵¹ M, MORAN WESTON. 1947. Labor forum. *New York Amsterdam News (1943-1961)*, Oct 04, 1947

¹⁵² Atom bomb may be new maginot line, says expert. 1946. *Chicago Daily Tribune (1923-1963)*, Feb 18, 1946

¹⁵³ WORLD STATE IS ONLY GUARD AGAINST ATOM BOMB, HUTCHINS SAYS. 1947. *Chicago Daily Tribune (1923-1963)*, Jan 09, 1947

¹⁵⁴ 2D ATOM BOMB RIPS JAPS! 1945. *Chicago Daily Tribune (1923-1963)*, Aug 09, 1945.

¹⁵⁵ Compton, Karl T. "If the Atomic Bomb Had Not Been Used." *The Atlantic*, December 1, 1946, 54-56

The Atomic Bomb would change the face of warfare for the next half-century as nations with it tiptoed around each other diplomatically out of fear of escalation and worldwide destruction. Whole cities could now be reduced to ashes with a single bomber. But, was this great leap forward in killing worth the costs? How did the strangest, most terrifying weapon to come out of World War II stack up against conventional bombs? As was stated earlier in this thesis, the idea of “making bombs out of atoms” was enough to get a man thrown out of a general’s office in 1942, so what made the United States turn to the atom for a weapon to stop the war?¹⁵⁶

Fanaticism and utter grim determination in the face of death colored the Japanese struggle for their Pacific holdings throughout the war. The island hopping campaign that the United States Marine Corps, Army, and Navy undertook during the war had shown the U.S. that much. These assaults rarely resulted in prisoners and quite often saw all Japanese forces on the island killed to a man. Racial hatred marked the entire war.¹⁵⁷ By 1945 American bombers were flying nightly sorties over mainland Japan firebombing cities. The firebombing attack on Tokyo the night of March 9-10 killed more than Hiroshima and Nagasaki combined.¹⁵⁸ Clearly, mass bombing raids were doing little to weaken the Japanese resolve. Here is the argument for the utility of a “shock weapon” like the Atom bomb. The cost of the project however throws this entire idea into question though. The Manhattan Project cost just fewer than 3 billion dollars to produce the two bombs.¹⁵⁹ Put in perspective, the fleet of 4,000 or so B-29s used for long range bombing of Japan cost roughly 3 billion. The cost per city destroyed by the atomic bombs (1

¹⁵⁶ Couffer, Jack. *Bat Bomb: World War II's Other Secret Weapon*. Austin: University of Texas Press, 1992 Pg. 61

¹⁵⁷ Dower, John W. *War without Mercy: Race and Power in the Pacific War*. New York: Pantheon Books, 1986. Pg. 236-240

¹⁵⁸ LeMay, Curtis E., and MacKinlay Kantor. *Mission with LeMay; My Story*,. Garden City, N.Y.: Doubleday, 1965. Pg. 387

¹⁵⁹ Edgerton, David. *The Shock of the Old: Technology and Global History since 1900*. Oxford: Oxford University Press, 2007. Pg 16

billion each) was enormous given the effectiveness of conventional firebombing at wiping out buildings and lives. The Atomic Bomb proved to be more useful in causing fear than conventional bombs. The War itself provided the ultimate opportunity for the United States to test such a world changing device.

In a postwar report, the U.S. Government reported that the atom bomb raised the destructive potential of a single bomber between 50 and 250 times.¹⁶⁰ This may seem an impressive number, but even the creators of the bomb were aware of the bomb's shortcomings as a tactical device. Rather, they recognized the necessity of the bomb in the future. As a means to end the current war, the atom bomb was an exceptional shock weapon, but its use seems to have been approved with the future in mind.¹⁶¹ True, the bomb's use was seen as the alternative to an invasion (Operation Olympic or Downfall) which was estimated to involve over one million American casualties, but the minds of the Manhattan Project were more aware that their creation was not fully indispensable.¹⁶² No other single device could produce such a devastating effect.

The bomb was ultimately approved for use because it was seen as a tool to end the war quickly and because leniency for Japan was not on the minds of American officials. Japanese fanaticism was on the minds of generals and politicians who advocated the atomic strikes. Vengeance for Pearl Harbor, the act that thrust the (then) very isolationist U.S. into the fray, was still on the minds of many.¹⁶³ The atomic bomb would change the shape of warfare, as its creators foresaw, and was one of the technologies that were guarded so closely and fervently by

¹⁶⁰ United States Strategic Bombing Survey: Summary Report (Pacific War), 1 July 1946. Washington: United States Government Printing Office, 1946

¹⁶¹ "Notes of Meeting of the Interim Committee, May 31, 1945. Miscellaneous Historical Documents Collection." Truman Library: The Decision to Drop the Atomic Bomb Online Research File

¹⁶² Sledge, E. B. *With the Old Breed at Peleliu and Okinawa*. Presidio Press Trade Pbk. ed. New York: Presidio Press, 2007. Pg. 312

¹⁶³ Telegram, Richard Russell to Harry S. Truman, August 7, 1945. Official File, Truman Papers.

the Americans during the next half-century. It was used as a terror weapon, and helped to end the Second World War. Fear of “The Bomb” would define the Cold War, just as the fear of more bombs shocked the Japanese into unconditional surrender. The weird idea that turned the atom into a weapon was hatched years before, but it took a global war for it to come to fruition. Another program that was utterly shrouded in secrecy during this time, Operation Paperclip, was a program that sought to employ many of the weird and world changing weapons designers from hostile countries (mostly Germany) in the immediate postwar period.

The development of weird weapons did not end with the dropping of the two atomic bombs, or the unconditional surrender of the Axis powers. Instead, as the so-called “Iron Curtin” fell, unconventional weapons development was refined and increased. The projects of the 1930s and ‘40s that were fringe science would be refined to the point of near perfection by the newly formed Soviet and Western blocs. Operation Paperclip was the American attempt to get a head start on the inevitable arms race by scooping up as many formerly Nazi scientists as possible. The individuals’ research ranged from rocket and jet propulsion to medical technologies (spurred on during the war as a result of unshackled human testing in the concentration camps) to chemical warfare technology. The program suggested a certain level of brain drain; the Joint Chiefs of Staff hoped to nullify Germany’s appetite for war.¹⁶⁴ Prisoners of interest were rounded up almost immediately. Mostly scientists and engineers, these men were separated from the typical German POWs into internment camps in Garmisch-Partenkirchen in the Bavarian Alps, in Heidenheim north of Munich, Zell am See in Austria and others across Western Europe. The question as to what to do with the hundreds of individuals whose minds produced some of the most frightening new arms of the world war loomed on the minds of Allied High Command.

¹⁶⁴ Jacobsen, Annie. *Operation Paperclip: The Secret Intelligence Program to Bring Nazi Scientists to America*. Pg. 87

General Dwight Eisenhower, knowing very well the importance of these individuals, had to request instructions as to what to do with these dangerous, yet obviously useful characters. The men who “harnessed the chariot of destruction” were to find employment in the United States and England.¹⁶⁵ Werner von Braun, the rocket scientist, Dr. Georg Wetz, who experimented with high altitude medical studies, the various minds behind sarin and tabun gases, all were taken under the wings of the American and put to work refining their discoveries with the intent of keeping them from the Soviets.¹⁶⁶ Many of the world’s most terrifying weapons, including bioweapons, virus bombs, and poison gases beyond compare were the plunder to be reaped from Germany’s vaults. Additionally, some of the most sickening human testing occurred under the watchful eyes of the men now employed by Paperclip. These tests included human vivisection to determine salt water’s effect when drunk in an emergency, the freezing of human subjects to determine the effects of frostbite, and the intentional inoculation of individuals with plague. Such experiments only came to pass because the Nazis allowed for such unrestrained testing. Autocracy had allowed the most inhuman of ideas to be unleashed on innocent political prisoners, Jews, and POWs. The United States looked to benefit from this research without having to reproduce such deadly experimentation at home. Instead, in preparation for the future, the U.S. would have to settle for those ex-Nazis of “national interest”.¹⁶⁷

Project Paperclip is evidence of how significant weird research and development, especially in the field of arms, was and still is as a political and martial issue. The continued proliferation of unconventional arms would be directed by very high powered individuals in

¹⁶⁵ Farren, W.S. quoted in Jacobsen, Pg. 85

¹⁶⁶ Jacobsen, Pgs. 274-75, 313

¹⁶⁷ Bower, Tom. *The Paperclip Conspiracy: The Hunt for the Nazi Scientists*. Boston: Little, Brown, 1987. Pg. 176

secret. The great minds pardoned and given employment by Paperclip would, however, be reined in in their projects. No more would they have access to unlimited slave labor, or test subjects for whom mortality was not an issue. The projects that Paperclip sponsored scientists would be responsible for during the Cold War built upon their World War Two tests, this time with supervision from the U.S. Army or Air Force.

Post-war research improved upon the lessons taught and learned during the conflict. This seems to repeat the example of the interwar period ten or so years before. Weapons development post-war was in response to pressures created by the Cold War and the various “hot” conflicts that spiraled off from it. The ex-Nazi scientists employed at this time helped build upon the developments made in Allied nations during the war, but in peacetime, ideas moved slowly; the urgency of combat and the economic stresses of war no longer were factors in determining what would receive attention or funding. Crazier projects would be torpedoed, whereas those with real potential like jet aircraft and chemical weapons were refined and adopted ubiquitously.¹⁶⁸ Project Paperclip was the logical byproduct of the Western desire to keep arms out of the hands of the Germans and Soviets, while simultaneously increasing their weapons capabilities in future wars. It came about as a result of the attention that some of the weirdest creations of the war generated.

Conclusion

The unconventional weapons that were developed and used in the latter half of the Second World War were produced with various objectives that stemmed from their nations’ unique needs. For the British, the pending invasion of Normandy was reason enough to develop purpose built engineering vehicles. This necessity was spurred forward by the lessons learned

¹⁶⁸ Jacobsen, Pg. 220-223

from the failure of the Assault on Dieppe. The approval of the arms tested, namely Hobart's Funnies, hinged on the lack of better, safer, alternatives along with the support of high ranking members of the British military like Hobart himself or Bernard Montgomery. The failure of weapons like the Great Panjandrum was for safety reasons rather than outright performance issues.

For the Nazis, their most unconventional arms, like the Vengeance weapons, jet aircraft, and interceptors, were desperate attempts to retaliate against or slow the inexorable advance of the Allies. All were utterly hopeless ideas given Germany's economic and infrastructural situation, but were great leaps forward in terms of technological innovation. The history of their use, while sparse, paved the way for future developments in American, British, or Soviet hands. Many of their designs, like the Me 163 Komet and the Ba 349 Natter, were interceptors that might have changed the nature of the air war over Europe had they not had so many design setbacks and shortcomings. As innovative and terrifying they were in the skies, more advanced, more refined designs were already in the works in the U.S. and Britain at the time. These designs never saw use because of the lack of a pressing need in those countries. The pressure to respond to the Allied bombing campaigns forced the fledgling German jet program to produce results much more rapidly in the latter half of the war. As a result of this desperation, ideas that ordinarily may have been seen as crazy, or too dangerous, received attention from German arms producers and generals.

For the Americans, atomic bomb research came as a result of not desperation, but opportunity. Scientists like Einstein, Oppenheimer, and Loomis presented the idea of a weapon capable of leveling a city in a single blow and it was adopted. The shock and terror generated by such a device could force any nation into unconditional surrender. Operation Paperclip, which

followed the war, sought to preserve the scientific gains of Nazi Germany while depriving that country of any opportunity for future violence. The competition of the future cold war with the Soviets was as present on the minds of the Joint Chiefs as was depriving the Germans of their technological wonders. Paperclip serves as an example of how necessary secret and strange arms production was in the global political scene. Those nations with the most terrifying weapons could and would be the ones to dictate the terms of peace in the postwar period.

The weird weapons of the late war helped to end the war, and fuel future conflicts. Jets, rockets, tanks, and atomic bomb research and development postwar would explode as an arms race between East and West began. As with most weird weapons, most in this period never left the drawing board. A special few changed the nature of warfare. All turned heads wherever they went and drew curious attention from military men as well as scientists.

Chapter 5

Conclusion

The Second World War is not the only conflict to see the development of odd or unconventional arms. Weird weapons development or arms development in general was expanded to hereto unseen levels during the War. This new modern war was to be a war of production. The nations that would come out on top would be those that could effectively out produce, out innovate, and out mobilize the others. Weird weapons were a product of this new type of war; they were symptomatic of countries who in their best effort to rearm during peacetime left holes in their arsenals. The gaps, brought to light by problems experienced during combat, had to be filled rapidly and effectively. Often times, unconventional, or odd arms appeared to solve these issues. Desperation and necessity caused by the war were the driving force behind arms production.

For many scientists, engineers, and amateur tinkerers the Second World War provided the opportunity to work for lucrative government contracts developing arms of increasing power and capabilities under patriotic auspices. The human element that came with weapons design often led to some products being as colorful and unconventional as minds behind them. Some of the weirdest weapons in history were produced during the frenetic seven year conflict. Some of these weapons were on the technological cutting edge, others sought to harness the power of nature, and others still made do with what was available. Almost all were heavily influenced by the leaders of their countries and saw either success or failure at their hands. Most were created because there lacked a suitable alternative in the arsenals of their respective nations. As such, they may have been colored by commentary describing them as “queer”, “miraculous”, or even as “crackpot ideas”; but despite this attention, unconventional arms still had a place in the war.

Weird ideas did not come from thin air, most of the men working on these projects were legitimate businessmen, scientists, engineers; they were not madmen nor were they written off as crazy. Rather, it was obvious that these individuals were just trying to do their part for their country during its darkest hours. Of course, there was always a profit motive in arms development, whether it was financial (Stuart Macrae's initial motivations) or for the sake of furthering science and medicine (many Paperclip scientists would justify their actions as such). But truly these individuals were just contributing what they saw as useful products that could fill the gaps in their militaries' arsenals.

There designs may have been described as oddball ideas at the time, but rarely were they written off because of this portrayal. This was largely because the majority of these unconventional arms were still well grounded in the realm of feasible possibilities. Most are quite strange, yes, but few are unthinkable works of fantasy. The Second World War did not see the creation of death rays, tractor beams, or comic book style super-soldiers. These ideas were written off before being written down. Sir Charles Goodeve of the Royal Navy described being pitched the idea for a weapon akin to a tractor beam and declare it absurd. The scientist pitching the idea claimed that the incidentals that were involved with actually creating such a beam were "merely matters of research and development easily solvable by anyone who really believed in the idea".¹⁶⁹ But, nobody in power ever did.

These ideas were those that had simply fallen off the deep end into the pool of pseudoscience and science fiction and as such were completely ignored by individuals of import. After all, there was still a war going on and precious resources were needed for weapons that were feasible and not fantasy. However, if a design were able to effectively navigate the tightrope between being innovative and insane it could expect at least some attention and in rare cases acceptance. The weapons described in the preceding chapters were those that achieved this feat. The Bat Bomb, the Ice Battleship, rockets, jet planes, these are all basically conventional ideas: how to terrorize a country? How to create ships with little use of resources? How to get revenge or outrun enemy planes? These are all very conventional

¹⁶⁹ Goodeve, Sir Charles. "The Ice Ship Fiasco." *The Evening Standard*, April 19, 1951

problems. The solutions to these issues were admittedly colorful, but still well within realistic parameters.

The creation of weird weapons would not stop with the end of the War either. The Cold War peace that followed saw an arms race between the United States and the Soviet Union. Atomic weapons, chemical weapons, biological weapons, new assault rifles, radar guidance, and delivery systems for WMDs were all researched and produced during the frosty peace. Wartime merely provided a testing ground for these devices and also often the impetus for the creation of new arms. The stresses and challenges of war compelled nations to rapidly innovate and push through otherwise fringe ideas in order to address pressing issues created during conflict. When the war ended, the most effective of these designs were adopted under the conventional arms umbrella; they were refined, improved, and, importantly, standardized.

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ACADEMIC VITA

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Research Intern with Gettysburg National Military Park

Worked extensively with the Park itself in their archives with John Heiser the Park's librarian and archivist. Also worked under the supervision of Dr. Carol Reardon, of Penn State's Richard's Civil War Era Center.

Was responsible for expanding said archives through exploration of NARA, the Pennsylvania State Archives in Harrisburg, the Soldiers and Sailors Memorial in Pittsburg, The Army Heritage and Education Center in Carlisle, PA, and the Western Pennsylvania Historical Society in Pittsburgh.

While working in these institutions was responsible for copying, transcribing and cataloging the primary sources that I found there including letters, telegrams, diary entries, and other documents relating to the battle of Gettysburg. This involved working extensively with curators, historians, and microfilm stewards.

Ultimately transcribed and submitted over 95 documents to the GNMP archives and library.

The Pennsylvania State University State College, PA United States

Major: History **Minor:** French and Political Science

Relevant Coursework, Licenses and Certifications:

History Courses completed:

HIST 001 The Western Heritage I

HIST 021 American Civilization Since 1877

HIST 011U Honors World History II
HIST 101 Ancient Rome
HIST 120 Europe Since 1848
HIST 130 Introduction to the Civil War Era, 1848 through 1877
HIST 143U Honors History of Fascism and Nazism
HIST 144 The Second World War
HIST 179 Latin-American History Since 1820
HIST 427U Germany Since 1860
HIST 418 French Revolution and Napoleonic Era
HIST 302M American Radicalism
HIST 490 Archival Management
HIST 494 Independent Thesis Workshop

Other History Related Coursework

ART H100 Introduction to Art
CAMS 105U Honors History of the Near East
PL SC 414 Dictators and Their Demise
PL SC 436 Civil Wars

French Coursework Completed:

FR 003 Intermediate French
FR 201 Oral Communication and Reading Comprehension
FR 202U Honors Grammar and Composition
FR 331 French Civilization I
FR 332 French Civilization II
FR 497A Collaboration and Complicity in France's World War Two

Fairview School District Fairview, PA United States

High School or equivalent 06/2011

Honors: Magna Cum Laude

Relevant Coursework, Licenses and Certifications:

National Honors Society, Dean's List, extensive foreign language education, wood and metal working coursework, and Advanced Placement Math, Science, English, History, and French courses.

Language	Spoken	Written	Read
French	Intermediate	Intermediate	Intermediate
English	Advanced	Advanced	Advanced

Paterno Fellows Program - Paterno Fellow

Schreyers Honors College - Honors Student

Alpha Phi Omega - Alumni Brother

ServeState Students for Philanthropy – Sergeant at Arms

Alpha Phi Theta Honors History Fraternity – Member

Pennsylvania State Rifle Team/Club – President

Skills:

Proficient in French speaking, writing, reading

Proficient with Microsoft Word, Excel, and PowerPoint

Proficient at research with primary and secondary sources

Proficient at public speaking:

Received numerous citations while participating in Student Congress

Extensive experience working with historically significant archival materials and documents

Worked in an archival setting with artifacts, boxes, and other types of archival materials.

Completed 75 + hours community service since Fall of 2013

Leadership Activity:

Trained new employees in Produce and Helping Hands at Wegmans Food Markets

As President, trained new members in proper firearms safety and handling for the Penn State Rifle Team/Club

Completed Alpha Phi Omega LAUNCH, a leadership education program.

Helped found ServeState Students for Philanthropy, served as Sergeant at Arms

Was Gettysburg National Military Park's first ever archival research intern