

Technological innovations in world war ii history essay



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World War II was a major turning point in political, social, and militaristic history. However, most important was the improvement and implementation of new technology; in particular, the German U-boat (unterseeboot in German), the invention of Radar by the British, and the employment of the Enigma code. The Germans, with their superior Kriegsmarine and Luftwaffe were light-years ahead of their allied counterparts and these allowed them a significant advantage when fighting the Allies. The invention and use of radar by the British helped forewarn British citizens of an impending attack by German bombers and thus, saved the people of Britain from great turmoil. The Germans used the U-boat to great effect targeting merchant ships and convoys without being detected. It also gave the Nazis unparalleled control over the Atlantic Ocean as they could dive down unnoticed and attack at will. Furthermore, the exploitation of the Enigma encoding machine allowed the Germans unequalled control over their vast fleets. The Allies, who were still blinded by the fact that World War II would be won by the primeval method of guns, tanks, and en masse attacks, were proven wrong. The Germans used their superior technology and battle tactics to herd the Allies like sheep into corners so that they could be slaughtered. It was only until the early 1940s that Britain had finally caught on and realized that they had to gain the upper-hand. Radar proved to be a viable asset to the British and thus, they managed to gain air superiority over the Germans. The use of radar was not only limited to tracking German aircraft movement, but was also used to track submarines when they surfaced to help better protect the convoys with merchant vessels.

The German U-boat. The mainstay of the Kriegsmarine. The sole reason why Nazi Germany had the upper hand in the battle for naval supremacy. This weapon of terror wielded superior technology and abilities and wreaked havoc upon the convoys of the Allied forces. Because no other navy in the world had a submarine force as effective as that of the Germans, many countries were skeptical about how much of an advantage the U-boats would bring. The Germans quickly seized the opportunity at the Allies' ignorance and quickly proved to the world how powerful a fleet of "unterseeboots" really were. The U-boats "were properly called submersibles, since they [spent] most of the time on the surface and submerged only for strictly limited time periods, during which they were slow and relatively unmanoeuvrable" (Miller 156). The U-boats used their hydrodynamic hull shape to cut through the water at speeds in excess of 20 knots for extended periods of time. The U-boats only went under the surface to stalk their prey and, eventually, sink it. The reason for this was also because of the limited duration the electric batteries could sustain underwater travel; they had to be recharged every eight hours or so by the submarine's diesel engine and were thus dubbed diesel-electric submarines (Miller 11). The U-boat had two primary weapons: torpedoes of different width and a main gun on the deck near the conning tower. The torpedo, although quite unreliable, was credited with almost 3000 kills of Allied ships and proved itself to be one of the most devastating weapons throughout the war. Since the guidance systems the Germans employed were not exactly "high-tech", the torpedoes would only "fly" straight meaning that the torpedoes would have to be aimed through the bow of the submarine before they could be let loose. Nevertheless, they packed enough explosives to cripple a ship from a glancing blow. There were

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two types of guidance systems: impact and magnetic. Impact meant that the torpedo had to hit something to explode and magnetic meant that it would sense the presence of a metal object in the water. The amount of TNT that was put into these torpedoes varied, but they managed to pack enough punch to crack a ship's hull in half with one hit.

“ The German campaign of unrestricted warfare against merchant vessels began with the sinking of the British passenger liner Athenia on September 3, 1939, the day Great Britain declared war on Germany” (Guerlac 99). And thus, the battle for naval supremacy had begun. This first strike on the enemy proved to the world that Germany had finally found its niche in naval warfare. There was no need to have an all out attack on British ships; all they needed were a few precision strikes against those ships of utmost importance. Once the weakest link was found and broken, it was easy for the Germans to control the enemy. “ Admiral Henning von Holtzendorff was the driving force behind the German declaration of unrestricted U-boat warfare in 1917” which basically meant that the Germans could patrol the seas freely and without question making them the perfect hunters for those enemy ships that wandered too close to Germany's shores (Stiffen 215). President Woodrow Wilson made a statement in 1916 before the memorandum of Holtzendorff was officially passed stating that “ the U. S. would not tolerate the continuation of such a policy and demanded it be revoked by the German government” (Speech Wilson). This explicated to the whole world that the Germans were becoming more ruthless with their submarine tactics and in World War II, it showed that their mercy had been reduced to just about nothing as they attacked ships without warning killing thousands of

lives. The long established method of a convoy, which had been used by the Allies since the end of World War I, was thought to be the perfect trap for German U-boats; through combined use of escort ships and depth charges, the Allies could protect the merchant vessels from attack by shielding them. However, in the midst of all of this havoc that the U-boats were creating, the British were hard at work trying to find more suitable and more effective countermeasures against the U-boats. During the later periods of World War II, the Allies had finally caught up with the Germans and had started waging successful counterattacks on the German submarines. Because of their vulnerability on the surface when they recharged their batteries, the U-boats were easy prey for any ship with big enough guns. However, since the Germans realized their weakness, they ordered the submarines to make use of the cover of darkness in order to recharge their batteries and thus, avoided detection from enemy observers.

The Germans' tactics, however, were again thwarted by the British. This constant battle between the Allies and the Germans to see who could find ways to deter each other raged for the better part of the war. The British, seeing that the Germans had discovered a way to foil the Royal Navy's protection and counter-offensive measures against U-boats, decided to implement a technology that they had created; one that had, until late 1942, had been used only for aerial defense and tactics. It was dubbed "Radar" which was short for RAdio Detection and Ranging. Its name suggests that "it is a system that uses radio waves to detect the presence of remote objects and to measure their location (range)" thus helping the British to forewarn their citizens about impending aerial bombings giving people enough time to

reach the public air raid shelters (Axelrod). This proved quite successful as the British managed to save most of the citizens of London from numerous bombings in the early years of the War. The Luftwaffe had no idea that the British could know that they were coming but, as an extra precaution, they took the cover of night to attack. Little did they know that they were doing only cosmetic damage to the city and not to the people. Thrilled by their successful achievement, the British decided to use radar for hunting U-boats on the surface and it became essential to gain not only visual detection, but also radar detection in order to provide accurate targeting coordinates to the ships with the depth charges. "The airplane with its wide field of vision, great range and flexibility, proved an ideal anti-submarine craft" and thus, the British started fitting these spotter aircraft with radar equipment such as the ASV (aircraft-to-surface vessel) radar which was one of the simplest and earliest types of radar detection equipment Britain had at its disposal (Guerlac 99). This allowed the British to not only track the enemy U-boats, but also helped the sailors prepare counterattacks to help protect the convoys.

After a few years, between 1942 and 43, the British had unveiled many more advanced types of radar capable of tracking surface objects from far greater distances. The first sets had effective ranges of only 600-2000 yards (Guerlac 99). Later innovations in microwave technology increased the useful range of the radar sets to well over five miles thus improving the Royal Navy's ability to search and destroy submarines. In addition, the new development of MAD (magnetic airborne detector) helped aircraft to find submerged bodies of metal by their magnetic fields though not from a great

distance (Guerlac 103). Nevertheless, the German U-boats still sought methods to remain undetected and thus, the Schnorkel was invented. The Schnorkel was a device that allowed a submarine to operate for extended periods under water without the need to surface which made the British's airborne radar systems quite obsolete. And thus, the race to innovate continued. " In December 1944, the Radiation Laboratory, under the request of the Navy, investigated radar detection of Schnorkel" which was supposed to aid in the detection of " schnorkelling" U-boats from the air (Guerlac 110). Though aircraft were seen as doing the grunt work - the flying around over water to find targets - the real hero in antisubmarine warfare was radar. Had it not been used in this way, the British would have lost over thrice the amount of ships and would still be using rudimentary methods of search and destroy and would be well behind the Germans in technological innovation. The use of radar also significantly impacted the way countries fought air wars; the fact that radar could provide knowledge in an instant changed the face of battle. Wars now would have to be won by intelligence rather than brute force and the use of radar proved this point with textbook precision.

The Germans, however, had one more ace up their sleeve and that was their " unbreakable" Enigma code. The Enigma code was essentially a Morse code transmission encrypted with a special encoding system. There were two coding machines, one on each side of the transmission, and they had rotors which would tell the radio operators which key to put into the machine to properly decode the message. The Germans had the right to say that it was " unbreakable" because of the astronomical amount of permutations and combinations the letters and numbers could be arranged. Since all U-boats

had one of these machines on board, much of the submarine warfare that occurred in the Atlantic was for possession of these coding machines. Much work went into the cracking of the Enigma code and this task was left to the Polish; they had acquired several of the Enigma coding machines but still had no idea how to crack or decode the code. A Polish cryptographer, Marian Rejewski, was known to be the first person to crack an Enigma transmission and he did so in 1932. The Germans, however, were quite complacent about the invincibility of their code and thus, took no notice of the stolen machines. However, the German's timely invasion of Poland in 1939 forced the Polish cryptographers to destroy all evidence of work on Enigma. Luckily, they managed to get a few working machines to the British who promptly set up Hut 8 at a place called Bletchley Park which consisted of a top secret group of cryptanalysts dedicated to solving Enigma. Even though the British had several machines, the " naval Enigma still could not be read. Seeing no chance of analyzing the machine, the British began to consider ways of capturing keys" which led to many brutal attacks on German U-boats with the slaughtering of the entire crew to prevent information leaks (Kahn 124). In order to aid in a swift decryption of the code, Alan Turing, the head of Hut 8, created a machine called the bombe which was an electromechanical device that simulated multiple Enigmas working at once thus helping the British decode more messages faster.

" The Enigma was, the navy said, ' the main cipher method of the Kriegsmarine.' All secret communications were to be enciphered with it" (Kahn 198). The German navy's reliance on this code was so vital to them, that had they not had that machine, they would never have been able to

communicate in such an open manner and would have had to resort to more primitive methods to keep their transmissions and messages secret. With Enigma, the Germans were able to keep their forces stretched thin and over a wide area but were still able to control them without the knowledge of the British. The sheer beauty of this plan was that because the codes were deemed “ unbreakable”, the Germans could operate over radio frequencies much more freely than their Allied counterparts giving them a tactical advantage as orders could be relayed with greater precision and no code words were needed. After the codes had been cracked, however, then Prime Minister Winston Churchill demanded constant knowledge of the contents of each decoded transmission so that he knew what the German U-boats were up to and could plan accordingly. This information was called “ Ultra” and was kept inside a locked brief case with the key around Churchill’s key ring. Because of the cracking of the Enigma code, the British were able to knock out German submarines before they became a threat, destroy supply vessels that they knew were filled with submarine parts, and attack bases they knew were not heavily fortified. Because “ Ultra” saved many shipping vessels from ultimate doom by destroying the U-boats before they attacked, Britain was able to sustain its war efforts and plan attacks on Germany. As an isolated event, “ it may be concluded that “ Ultra” saved the world two years of war, billions of dollars, and millions of lives” which goes to show how great an impact the information these Enigma coded transmission held. However in retrospect, it didn’t matter what the code breakers did at Hut 8; as a whole, had the Germans kept of fighting, the first atomic bomb would have been dropped, not on Hiroshima, but on Germany instead and the war would still have ended. But, it’s still an amazing feat how the British code breakers

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at Hut 8 were able to crack this “ unbreakable” code and use it to their advantage.

World War II was a breeding ground for new technology. It spurred many advances including that of naval warfare, antisubmarine warfare, and cryptology. The U-boat, Germany’s basis of the Kriegsmarine proved to the world that warfare was not always about frontal assaults; it was also about stealth and planning. Britain’s use of radar against air attacks and U-boat torpedoing demonstrated that knowledge was more valuable than depth charges and one had to accurately know where the enemy was before launching an attack. In addition, Germany’s Enigma code showed the world that intelligence was everything in war. It also changed the way military leaders viewed future conflicts; intelligence was placed at a higher priority level than manufacturing better tanks. These technological impacts depicted war as a whole different animal. While World War I was all about guns and tanks, World War II was quite different slowly evolving into war as we know it today. These three advancements, although they didn’t turn the tide of the war significantly, all proved the same thing: that information and intelligence has dominance over actual fighting and that the end World War II indicated an end to fighting in open fields and a start to planned, surgical strikes.