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Ultra and the Battle of the Atlantic - The True Story

By Tim D. Lyon¹

The Battle of the Atlantic was the dominating factor all throughout the war. Battles might be won or lost, enterprises might succeed or miscarry, territories might be gained or quitted, but dominating all our power to carry on the war, or even keep ourselves alive, lay our mastery of the ocean routes and the free approach and entry to our ports.²

Winston Churchill

The Battle of the Atlantic was the longest battle of the Second World War, lasting from 3rd September 1939 to 10th May 1945. The German attack on merchant shipping in the Atlantic was countered partly by code-breaking intelligence known as Ultra. It was actually known as Special Intelligence, Ultra was merely a security classification. However, this paper will refer to it as Ultra as this term has come into common usage. And in this paper the term Ultra only applies to the products of Bletchley Park, ie decrypted messages in the German Enigma Cipher.

The Enigma machine was one of the best of the new electromechanical cipher machines produced for the commercial market in the 1920s. All three services in the German Wehrmacht, the Army, the Luftwaffe and the Navy adopted the Enigma machine.

Early in 1939 Britain's secret service set up Station X at Bletchley Park 50 miles north of London, for the purpose of intercepting the German's Enigma signals (more than 1,000 daily in 1939³) and controlling the distribution of the resultant 'Ultra' secret intelligence. Some of the German Air Force Enigma ciphers were cracked as early as April 1940, and the Army ones not long afterwards. However, the German Naval Enigma would not be cracked until the war was 21 months old.

Ultra was absent from military history books on the Second World War due to security considerations until the 1970s. In particular, it was not mentioned in any of the memoirs of the war's principal leaders. The existence of Ultra was revealed in 1974 by the publication of *The Ultra Secret* by F.W. Winterbotham (although, strictly speaking, it was the first book in English about Ultra⁴).

When Ultra was revealed it was almost literally leapt on by military historians. Suddenly, Ultra started appearing in numerous books as the factor which had won the Second World War for the

¹ Tim Lyon is a member of the Naval Historical Society of Australia, Vice President of the ACT Branch of the Military Historical Society of Australia and researched the Battle of the Atlantic extensively between 2014 and 2018. He is a retired Naval Architect and Army Reserve Officer.

² Churchill, Winston, *The Second World War*, Cassell & Co. Ltd.

³ Rohwer, Jürgen, *The German View*, a paper presented at the Naval Symposium at the U.S. Naval Academy in Annapolis on October 28, 1977, page 11.

⁴ In 1973, the Paris publishing house Plon published Gustave Bertrand's book, *Enigma ou la plus grande énigme de la guerre 1939-1945* (Enigma, or the Greatest Enigma of the War of 1939-1945).

Allies. Many books, essays and TV shows since 1974 have suggested that, because of Ultra, the Allies almost always had knowledge of German intentions. Whilst this was clearly not the case, it was evident that Ultra was responsible for major, even crucial, tactical, operational and strategic successes in the Second World War. But there were also many truly extraordinary claims made regarding the impact of Ultra on the outcome of the war.

Now the question remains how much did it shorten the war, leaving aside the contribution made to the campaigns in the Far East on which the necessary work hasn't been done yet. My own conclusion is that it shortened the war by not less than two years and probably by four years - that is the war in the Atlantic, the Mediterranean and Europe.⁵

Sir Harry Hinsley⁶

It seems odd that none of the very large number of books written about and analysing the Second World War prior to the revealing of Ultra ever conveyed the impression that a major factor in the winning of the war was mysteriously missing or invisible. If it was such a major factor (the war winning factor) why did these authors not puzzle over how the Allies had won the war? Or, at least, how they had won it so easily and so quickly?

The dramatic revelation of Ultra in the mid-1970s resulted in many works giving this as the most important factor in Allied success in the Battle of the Atlantic. Having been absent from books on the Battle of the Atlantic before 1974, Ultra came to dominate all new works on the topic subsequently. Not too surprisingly, authors were attracted by this new, mysterious and exciting revelation. Suddenly, Ultra was the factor that had won the Battle of the Atlantic for the Allies. It was responsible for all the Allied successes in the battle. Before long, this new story was widely published and became the accepted narrative.

A great deal of material (books and academic papers) has been published concerning Ultra and the Battle of the Atlantic since 1974. There is, however, a significant difference between the published story and the true story.

It should be noted that the advent of the Internet has made accessible a great deal of information on this topic that was not available to researchers in the 1970s, 1980s and 1990s. In particular, primary source documents held at Bletchley Park and by the U.S. National Security Agency are now (reasonably) readily accessible.

⁵ Hinsley, Harry, *The Influence of ULTRA in the Second World War*, an interview at the Babbage Lecture Theatre, University of Cambridge Computer Laboratory, 19th October 1993.

⁶ Sir Harry Hinsley worked at Bletchley Park from 1939 to 1946 and then came back to Cambridge and became Professor of the History of International Relations and Master of St John's College. He is also the official historian of British Intelligence in the Second World War (three volumes).

The Published Story

The German Naval Enigma was first broken June 1941. The following extracts are representative of what has been the published story of Ultra and the Battle of the Atlantic.

The decyphered messages were passed via Z Watch, the Naval Section's equivalent of Hut 3, over a newly installed teleprinter link to the OIC, giving prior warning of the wolf pack patrol lines and allowing the convoys to be routed away from danger. The result was truly dramatic. Between March and June 1941, the U-boats had sunk 282,000 tons of shipping a month. From July, the figure dropped to 120,000 tons a month and by November, when the wolf packs were temporarily withdrawn from the Atlantic, to 62,000 tons.

The breaking of the naval Enigma was one of the main reasons for this drop in the fortunes of the U-boats, providing the British with a welcome respite during which the vital supplies had a much greater chance of getting through, Harry Hinsley said.⁷

Once you have identified the Ultra (which you now can from the decrypts in the Public Record Office) you can see pretty clearly (if you have also got the record of the war) that Ultra was the main reason why the British were able to reduce the depredations of the U-Boats in the Atlantic in the second half of 1941.⁸

On 1 February 1942, the U-boats introduced the fourth wheel, creating a new cypher dubbed Shark by the Bletchley Park code-breakers. The extra wheel had rendered Banburismus useless, recalled Shaun Wylie, head of the crib section in Hut 8. While they could continue to get Dolphin out, they were now unable to do anything with Shark. The vital intelligence the OIC had been using to re-route the Atlantic convoys had disappeared.

We were dismayed when the fourth wheel appeared. We knew it was coming. But it was a grim time. We were very much frustrated, the things that we'd hoped to use went bad on us. We realised that our work meant lives and it ceased to be fun. We did what we could, of course, and we got on with what there was but we kept an eye out for any possibility on Shark that might present itself. There was a lot of pressure and we were trying all we could but we didn't have many opportunities. We had to get Dolphin out, but Shark was the prime target, the focus of our interest.⁹

On October 30, 1942, in the Mediterranean, a German U-boat was forced to surface, and a specially trained British boarding party was able to board it and salvage important cipher materials, especially the weather short signal book. This was used to find "cribs," the cipher/clear text compromises that aided in determining daily settings of the M4 machine. Thus, from mid-December 1942, Bletchley Park could once again send to the submarine tracking room of the Admiralty the dispositions of the German U-boat wolf packs in order to reroute convoys. But there were now so many wolf packs that new tactics had to be found to avoid repetition of the heavy losses incurred in mid-March, when the Germans introduced a new weather short signal book, producing a new blackout.

⁷ Smith, Michael, *Station X – The Codebreakers of Bletchley Park*, Channel Four Books, page 66.

⁸ Hinsley.

⁹ Smith, page 109.

By concentrating the available bombs to U-boat traffic, Bletchley Park was again able after only 10 days to break the U-boat cipher.¹⁰

So that when the U-Boats returned to the Atlantic after their first defeat (they did that in the autumn of 1942), they had been delayed in making a decisive thrust for more than a year. Now when they returned they had been supplied with an advanced Enigma, one that instead of using three wheels concurrently used four wheels, which as you can see noticeably increased the mathematical difficulties of solving the key.

In fact Bletchley couldn't solve it from February to December 1942. Mercifully for us (though not for the Americans) most of the U-Boats were on the Atlantic American coast at that time, but as they came back to the North Atlantic convoys they were still using this cipher and they brought about another crisis in the Atlantic.

It again was the Ultra which brought them under control. The figures of sinkings of Allied shipping reached the highest in the war in March '43. They had been brought down by May '43 to lower proportions than ever before in the war as a result of this return of Ultra to the scene.¹¹

In early 1943, Admiral Ernest J. King, U.S. Chief of Naval Operations (CNO), pushed to use U-boat location information derived from Ultra to attack Germany's tanker U-boats (known as Milch Cows).

... in 1943 the changing locations of these Milchcows became available to us through Ultra. By this time too, there was very close liaison between Coastal Command and their American counterpart who were especially able to cover the southern Atlantic convoy routes. With typical enthusiasm the Americans were all for sinking the Milchcows at once; they were, however, persuaded by Jack Slessor, Commander-in-Chief Coastal Command, not to give Doenitz cause to suspect Ultra and the Milchcows were quietly sent to the bottom over a reasonable time; it must have been one of the greatest blows suffered by the U boats.¹²

The U.S. Navy pressed for, and got, British agreement to give priority to smashing the Milch cows by using the Special Intelligence position reports to locate them. The operations were carried out in a variety of different locations, usually by aircraft so as not to arouse German suspicions. U-118 was the first to be destroyed - by the Bogue, to be followed by U-487, which was surprised on 13 July by one of the Gore's Wildcats. It dived and attacked the Milch-cow as the crew were sunning themselves on deck. Their fast reactions in manning the guns and shooting down the first attacker almost saved them but shortly afterwards, a flight of three more Avengers swooped down to bomb the U-boat to destruction. Three days later, an aircraft from the Core sank U-87 which was searching for the Milch-cow in order to refuel.

Before the end of July three more U-tankers had been located in transit through the Bay of Biscay. On 4 August the Royal Canadian Air Force sank another off Iceland, three days later the Tenth Fleet's escort carrier Card sank U-460 north of the Azores and her planes dispatched another eight weeks

¹⁰ *World War II at Sea: An Encyclopedia* [2 volumes] edited by Spencer C. Tucker, page 674.

¹¹ Hinsley.

¹² Winterbotham, F.W., *The Ultra Secret*, Futura Publications Limited, A Contact Book, page 111.

later. Dönitz's elaborate supply system had been decisively knocked out; the U-boat campaign in the mid-Atlantic was crippled.¹³

There can be little doubt that the naval Enigma decrypts helped to shorten the war.¹⁴

The above has been the popular narrative since the existence of Ultra was revealed in 1974. The extracts have come from seemingly reliable (some from seemingly impeccable) sources. So it is very strange that it should turn out that most of the above is not true.

The True Story



Figure 1 - M-3 Enigma machine (Bundesarchiv, Bild 183-2007-0705-502 / Walther / CC-BY-SA 3.0)

At the beginning of the war, the German Navy's enigma machine was the Funkschlüssel M (the most common variant being the M-3, shown in Figure 1). It was identical to the model used by the German Army and Air Force, but it was supplied with three additional rotors, VI, VII and VIII, which were reserved exclusively for naval use.¹⁵ There were instructions that one of the three rotors in the machine had to be a Naval rotor (VI-VIII) and that that particular naval rotor could not be used in the same position on two successive days. It had four different settings, three

of which were changed daily, and one of which was changed with each message. These gave a huge number of possible cipher combinations. These settings are shown in Table 1. The four settings were known as the 'key' or 'daily key' to the Bletchley Park cryptographers.

Table 1 - Funkschlüssel M-3 Enigma Machine Settings

Setting	Machine Component	Option
First	Rotors	The Walzenlage or rotor order for that date. For example: IV, I, VI
Second	Rotors	The Ringstellung, or ring setting for that date. For example: 23 02 17
Third	Plugboard	The Steckerverbindungen or plugging for that date. For example: AR KT MW LC XD EJ ZB UY PS HN
Fourth	Rotors	The Grundstellung, or discriminant (starting position for each rotor) for that date. For example: TXM

To make things even more difficult, the first three settings were contained in a code book entirely separate to the Enigma cipher. The code book listed the four parameters for setting up the Enigma: the date and the first three settings shown in Table 1. The fourth setting (the Kennggruppen) was transmitted at the beginning of the message. The following principal code books were likely in use at the start of the war: Hydra, Tetis, Aegir, Neptun, Special Cipher 100, Tibet, Freya, Sleipner and Bertok. Hydra (known as Dolphin by the Allies) was used for all surface ships in the Baltic and North

¹³ Costello, John and Hughes, Terry, *The Battle of the Atlantic*, Collins, 1977, page 290.

¹⁴ Erskine, Ralph, *Breaking Naval Enigma (Dolphin and Shark)*, page 1.

¹⁵ Erskine, page 1.

Sea and then for ships operating from or off the occupied territories; it was, in consequence, the cipher used for minesweepers and anti-submarine and patrol craft in Norway and France. It was also, initially, the cipher used by all operational U-boats.¹⁶

The German Navy also employed codebooks to shorten signals in order to protect against high frequency, land-based direction finding. The first of the two most important books was the *Kurzsignalheft*, the short signal book that was used for operational messages, including reports of location, situations, enemy reports and convoy sightings (position, course and speed). The second book was the *Wetterkurzschlüssel* that was used for weather reports.

In addition, to avoid putting map grid references in messages the German navy adopted a very simple yet clever system called the German Naval Grid Reference to encode the positions of their U-Boats, other German Navy ships and enemy convoys, possibly known as the 'Adressbuch' to the U-boat crews. The Atlantic Ocean was divided into zones, and each zone was divided into squares that were assigned a two-letter designation (e.g. AE, AF, BA, BB, etc.). Each square was further divided into a 3 x 3 matrix, so that there were nine medium squares. These nine medium squares were again divided into nine smaller squares. This was known as a Grid, so that there were now 81 total grid squares within a sector. A U-boat's location would, therefore be encoded as BB8634, for example. To further encode the location, when assigning square numbers within the medium and smaller squares, not all numbers were used. They were also irregularly assigned.

Bletchley Park had acquired a replica of an Enigma machine and rotors I to V from the Poles in August 1939. The British recovered rotors VI and VII from the crew of *U-33* on 12th February 1940. An example of rotor VIII was captured on 31st May 1940 from *U-13*.¹⁷ But without a Hydra code book, *Kurzsignalheft*, *Wetterkurzschlüssel* and Naval Grid Reference it is not surprising, therefore, that the German Naval Enigma was not broken until June 1941.

The Battle of the Atlantic was also a battle between the cryptographers on each side. The B-Dienst (German: Beobachtungsdienst, observation service) was a Department of the German Naval Intelligence Service that dealt with the interception and recording, decoding and analysis of the enemy, in particular British, radio communications before and during the Second World War. The British and Allied Merchant Ship (BAMS) code (sometimes called the Merchant Navy Code), a pre-war invention used for essential transmissions to independently routed ships, was an open book to the B-Dienst.¹⁸ B-Dienst had cracked the BAMS code pre-war and then had captured the BAMS codebook in May 1940 in Bergen, Norway.

In the spring of 1940, Alan Turing and Peter Twinn had set up a naval Enigma research group in Hut 8 at Bletchley Park. In early May, Turing broke the keys for some days in April. In early 1941, with

¹⁶ Beesly, Patrick, *Very Special Intelligence, The Story of the Admiralty's Operational Intelligence Centre in World War II*, Sphere Books, 1977, pages 97-98.

¹⁷ Wilcox, Jennifer, *Solving the Enigma: History of the Cryptanalytic Bombe*, Center for Cryptologic History, National Security Agency Revised 2006, pages 13-14.

¹⁸ van der Vat, Dan, *The Atlantic Campaign*, Hodder & Stoughton, 1988, page 230.

the help of captured material (spare rotors and the keys for the complete month of February 1941¹⁹ from the German armed trawler *Krebs*) from a commando raid in the Lofoten Islands, Hut 8 broke some naval Enigma for February and April. But few, if any, of the decrypts were available in time for them to be operationally useful to the Admiralty's Operational Intelligence Centre (OIC). In particular, Hut 8 played no significant part in the hunt for and sinking of the *Bismarck*.²⁰ It was realised that only the capture of a naval Enigma machine with the current settings, a Hydra code book, a Kurzsignalheft and Wetterkurzschlüssel would allow Hut 8 to break the naval Enigma.²¹

The Lofoten raid triggered some special operations mounted for the sole purpose of securing Enigma machines and their associated coding documents. On 7th May 1941, the German trawler *München* was captured and 'ancillary material relating to the settings of the cipher used by the trawlers was secured'.²² On 25th June 1941, the German weather reporting trawler *Lauenberg* was captured with 'documents and cipher material which the Admiralty subsequently described as being of 'inestimable value'.²³

Then, on 9th May 1941, *U-110* under the command of Fritz Lemp, together with *U-201*, attacked a convoy just south of Iceland. HMS *Aubretia*, one of the convoy escorts, spotted *U-110*'s periscope and attacked with depth charges. *U-110* survived the first attack but soon two destroyers HMS *Bulldog* and HMS *Broadway* joined the hunt. *U-110* was forced to surface. HMS *Bulldog* immediately set course to ram, but her captain realised it might be possible to capture *U-110* and veered aside at the last moment (see Figure 2). Lemp, assuming his U-boat was about to be sunk, ordered Abandon Ship and expected that its cryptographic material would go down with her. A boarding party was despatched, instructed in what to look for, and systematically stripped the U-boat of anything of interest that was portable.

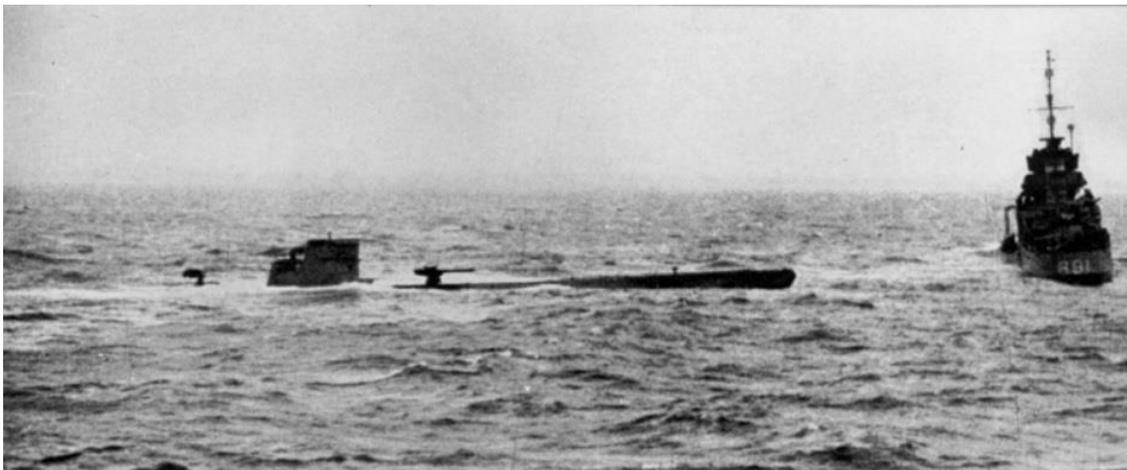


Figure 2 - Capture of *U-110* (Royal Navy official photographer)

¹⁹ Alexander, C.H.O'D., *Cryptographic History of Work on the German Naval Enigma*, HW 25/1, Government Code and Cypher School: Cryptographic Studies, 1946, page 27.

²⁰ Beesly, *Very Special Intelligence*, page 127.

²¹ Beesly, *Very Special Intelligence*, page 105.

²² Beesly, *Very Special Intelligence*, page 105.

²³ Beesly, *Very Special Intelligence*, page 105.

An M-3 Enigma machine was certainly recovered from *U-110*. There is some variance and lack of specifics in the literature concerning what other cryptographic materials were recovered. One source mentions 'indicator books'²⁴, another mentions 'keys to reading the U-Boat's short signals and weather reports' and 'a set of bigram tables'²⁵ and still another 'operation manuals and setup data'²⁶. Jennifer Wilcox wrote 'With the rotors and the keys through June, Bletchley didn't even need the Bombes in order to read the messages'²⁷, indicating a Hydra code book was amongst the haul. Significantly, Patrick Beesly wrote in his book that the British 'recovered, intact and undamaged, its cipher machine with all its accompanying material and many other secret documents'.²⁸ Beesly further wrote that 'U110's cipher material ... soon permitted BP to start reading currently and on a completely up-to-date basis cipher Hydra'.²⁹ And Hugh Alexander wrote in his book that the June and July keys were captured³⁰ and the Wetterkurzschlüssel, the Kurzsinalheft and a Kenngruppenheft³¹. 'Keys', 'bigram tables' and the Kenngruppenheft only relate to the Enigma machine and have no meaning in the context of the short signal code books. So, it can be concluded that a Hydra code book as well as a Wetterkurzschlüssel and a Kurzsinalheft were captured. It is highly unlikely that *U-110*'s crew would have disposed of or destroyed the Hydra code book but none of the other cryptographic material.

The material captured from *U-110* (and particularly the Hydra code book) meant that in broad terms current reading of the Hydra cipher was achieved from the end of May 1941 to July or August (without even having to use bombes³²³³). The captured Hydra code book was valid until the end of June or early July³⁴. Thereafter, with the use of the bombes, time lags of from 24 to 48 hours began to occur, although there was some current reading.³⁵ Of course, the weather short signals were encoded using the Wetterkurzschlüssel and the operational short signals using the Kurzsinalheft before being transmitted in the Hydra cipher on the Enigma machine, ie double encipherment. So, the reading of messages entailed first decrypting the Hydra message and then the short signal could be decrypted directly as Hut 8 had the code books.

Ultra was now able to make its first contributions in the Battle of the Atlantic. *Bismarck*'s supply fleet had consisted of six tankers and one supply ship. They were there not only to re-supply the

²⁴ Erskine, page 2.

²⁵ Carper, Colleen, *Bletchley's Secret War: British Code Breaking in the Battle of the Atlantic*, Thesis, Ashbrook Scholar Program, Ashland University, Ohio, page 28.

²⁶ Azzole, Pete, *ULTRA: THE SILVER BULLET, Breaking the German Enigma Codes*, CRYPTOLOG, the Journal of the U.S. Naval Cryptologic Veterans Association.

²⁷ Wilcox, page 15.

²⁸ Beesly, *Very Special Intelligence*, page 106.

²⁹ Beesly, *Very Special Intelligence*, page 106.

³⁰ Alexander, page 30.

³¹ Alexander, page 49.

³² Wilcox, page 15.

³³ Electro-mechanical machines that could try out different potential rotor settings in order to determine the actual one used.

³⁴ Beesly, *Very Special Intelligence*, page 106.

³⁵ Beesly, Patrick, *The British View*, a paper presented at the Naval Symposium at the U.S. Naval Academy in Annapolis on 28th October, 1977, page 7.

Bismarck and *Prinz Eugen* but also U-boats, and so their locations were notified to all U-boats likely to encounter them. These messages were decrypted in Hut 8 and the Ultra sent to the OIC. Between 3rd and 15th June, the six tankers and the supply ship were intercepted by RN ships. In addition, two supply ships for armed merchant raiders were also intercepted. Two of the ships were captured while the remainder were either sunk or scuttled themselves.³⁶

On 23rd June 1941 Ultra was able to give the OIC advance warning that a Wolf Pack of ten U-boats was being positioned to attack convoy HX 133 heading for Liverpool, which had been sighted by *U-203* south of Greenland. Western Approaches Command immediately signalled the Senior Officer Escort (S.O.E.) to change the convoy's course. At the same time HX 133's escort was reinforced by ships from two nearby westbound convoys which the OIC confirmed were not in immediate danger. HX 133's escort now comprised 13 warships. RAF Coastal Command aircraft were concentrated ahead and on either side of the convoy so that the U-boats were continually forced to submerge. Five merchant ships and two U-boats were sunk in the ensuing battle. Although the U-boats intercepted OB 336, one of the now weakly escorted westbound convoys, and sank three empty freighters, Ultra had made a significant contribution.

In May 1941, 436,544 tons of shipping was sunk in the Atlantic, followed by 415,255 tons in June. In July this dropped to 113,078 tons, then 103,452 tons in August, 254,851 tons in September, 195,886 tons in October, 85,500 tons in November and 113,802 tons in December. Ultra was certainly a factor in this dramatic drop in shipping losses in the Atlantic in the second half of 1941. But it wasn't the only factor.³⁷

In September 1939, immediately after Britain's declaration of war against Germany, U.S. President Roosevelt had formulated a plan for a 'security zone' many miles out into the Atlantic and ordered patrols of American warships to preserve U.S. neutrality by keeping ships of belligerent nations outside this zone. Despite their official neutrality, American warships had also, from the very beginning, reported the positions of German merchant vessels to the British. On 18th April 1941, Admiral King stated that the 'security zone' had been extended to 26 degrees west, an area that included Greenland, Iceland and the Azores, and ended only 740 sea miles from the coast of Europe. On the same day, President Roosevelt ordered the Atlantic Fleet to attack any Axis ships found in the expanded Neutrality Zone. U-boats only occasionally ventured into the Neutrality Zone to hunt for convoys heading toward Germany's declared War Zone.³⁸

On 20th June 1941, *U-203* sighted the battleship USS *Texas* and a screen of destroyers, steaming ten miles off Greenland inside Germany's declared war zone (where Germany had declared that all shipping might be sunk on sight). *U-203* decided to attack but the attack failed. The U-boat remained undetected. *U-203* reported the incident to Dönitz who sent out a signal to all U-boats:

³⁶ Beesly, *Very Special Intelligence*, pages 127-128.

³⁷ Kahn, David, *Codebreaking and the Battle of the Atlantic*, USAFA Harmon Memorial Lecture #36, 4th April 1994.

³⁸ Hussey, Brian F., *The U. S. Navy, The Neutrality Patrol, and Atlantic Fleet Escort Operations, 1939-1941*, U.S.N.A. - Trident Scholar project report; no. 180 (1991), page 95.

American warships, even if met within the blockade area, will not be attacked, since the current permission given to us to do so does not, in my opinion, coincide with the Fuehrer's political intentions.³⁹

[Which were that Operation Barbarossa was set to commence on 22nd June 1941.]

Hitler wanted no 'incident' with the United States until the Soviet Union had been dealt with. He then over-reacted and the following signal was made to all U-boats:

Fuehrer orders avoidance any incident with USA during next few weeks. Order will be rigidly observed in all circumstances. In addition attacks till further orders will be restricted to cruisers, battleships and aircraft carriers and then only when identified beyond doubt as hostile. Fact that warship is sailing without lights will not be regarded as proof of enemy identity.⁴⁰

This meant that Allied escort vessels, even British ones, could not be attacked by U-boats in the Atlantic. This, not surprisingly, significantly reduced the effectiveness of the U-boat force in attacking convoys.

In July the United States 'security zone' was still further extended to 22 degrees west, to coincide with the arrival by United States military forces in Iceland which the new security zone covered. After these forces arrived in Iceland, the U.S. Navy assumed the responsibility for the direct protection of all convoys of American ships bound for Iceland and of any such ships of other nationalities as wished to attach themselves to such convoys. In addition the US naval forces were given instructions to guarantee the safety of other convoys in the North Atlantic whenever the strategic situation demanded.⁴¹ In practice, the Atlantic Fleet was made responsible for the escort of all convoys west of 26 degrees west. This, in fact, meant that it was virtually impossible for the U-boats to attack convoys heading to Britain until they exited the sea areas round Iceland.

During the summer months of 1941, Doenitz' efforts were continually thwarted by orders to withdraw some of his U-boats from operations against Allied shipping in the Atlantic and make them available for duties of various kinds elsewhere. The Luftwaffe permanently claimed two U-boats for long distance weather information. In July, six U-boats were ordered into Arctic waters for action against Russia. But this area of the ocean was empty. U-boats were called on to escort auxiliary cruisers, supply ships and captured prize vessels

From April to June 1941, the average number of U-boats at sea in the Atlantic was 30. However, during July and August 1941, there were generally only eight to twelve U-boats in the Atlantic⁴², in the vast sea area from Greenland to the Azores, and possibly as few as four on some occasions.⁴³ In

³⁹ Dönitz, Karl, *Memoirs, Ten Years and Twenty Days*, Cassell, 1990, page 189.

⁴⁰ Dönitz, *Memoirs*, pages 189-190.

⁴¹ C-in-C (American) Atlantic Fleet Operation Order No. 6 dated 19th July 1941.

⁴² Dönitz, *Memoirs*, page 177.

⁴³ Dimpleby, Jonathan, *The Battle of the Atlantic, How the Allies Won the War*, Penguin, 2015, page 153.

September 1941, six U-boats were transferred from the Atlantic to the Mediterranean to support Rommel's North African campaign

In September 1941, the xB-Dienst (the cryptographic department of the B-dienst) began deciphering the British Naval Cipher No. 2 more readily. And in December the xB-Dienst cryptanalysts began penetrating into the British Naval Cipher No. 3, which was in use for communications with and between Allied ships, and also with the USN, in the Atlantic.⁴⁴ Unlike Hut 8 they were never able to read all the messages for any period, but they knew when convoys were due to sail and their planned routes. They could even establish convoy positions and read their orders. But at this time the xB-Dienst could decrypt Allied signals with considerable time lag only. But they 'got enough dates to reconstruct the convoy time-table'.⁴⁵

Also in September Dönitz had become concerned that 'our cipher has been compromised, or that there has been some other breach of security.'⁴⁶ The B-dienst advised that there was no cause for concern with regard to Enigma but Dönitz asked the head of the Kriegsmarine's communications, Vice-Admiral Erhard Maertens, to investigate further. On 24th October, Maertens wrote to Dönitz: 'The acute disquiet about the compromise of our Secret Operation cannot be justified. Our cipher does not appear to be broken.'⁴⁷

On 15th September 1941, the U.S. Navy announced that it would provide protection for ships of every flag carrying supplies between the American continent and the waters adjacent to Iceland, on which a U.S. base had been established in July 1941. On 16th September 1941 the first convoy (HX 150) to have U.S. Navy ships as part of its escort sailed from Halifax.

Despite this active involvement by the U.S. in the Battle of the Atlantic, Dönitz was ordered to forbid U-boats to proceed west of Newfoundland to prevent any incident in this area. This was with a view to avoiding war with America. The U-boats were unable, therefore, to find convoys proceeding to England near their point of departure and where they were likely to be concentrated, for example near Halifax, but had to remain further out in the Atlantic, where it was possible for the convoys to diverge.⁴⁸

On 1st November 1941 a U-boat sighted a convoy near Newfoundland. A Wolf Pack was lying in wait to the east of the convoy and ideally placed to attack it. Thick fog persisted during the next few days, however, and the operation was a complete failure. This was the last contact by a U-boat with a convoy in November in the North Atlantic. Also later in November, Hitler and the OKW became worried about the British CRUSADER offensive, which had started 18th November, and by some information that British and Gaullist forces intended to conduct a landing in French North Africa. Dönitz was told this 'places Italy and our whole position in the Mediterranean in a situation

⁴⁴ van der Vat, page 229.

⁴⁵ Rohwer, *The German View*, page 10.

⁴⁶ Dönitz, Karl, War Diary 28th September 1941.

⁴⁷ Maertens' letter can be found on Microfilm Reel 40, MOD.

⁴⁸ Dönitz, Karl, *The Conduct of the War at Sea, An Essay*, Division of Naval Intelligence, Office of the Chief of Naval Operations, 15th January 1946, page 13.

of acute danger ... the importance to our whole war effort of retaining our position in the Mediterranean necessitate(s) a complete reorientation of the focal areas of U-boat activities until the situation has been restored'.⁴⁹

BdU⁵⁰ was ordered to send another ten U-boats to the eastern Mediterranean, and to station a permanent force of fifteen astride the Straits of Gibraltar. Dönitz observed that 'it meant the commitment of the entire U-boat arm to the Mediterranean and the Gibraltar area and the cessation of U-boat activities in the main Atlantic theatre of operations'.⁵¹

Also, during this period in the Battle of the Atlantic, the British introduced two significant improvements to the equipment carried by escort ships. After the fall of France in June 1940, a requirement was formulated for a ship-fitted radar set to detect surfaced submarines or invasion craft. By early March 1941, some 90 escort ships had been fitted with the fixed aerial Type 286M radar. By September 1941, 37 escort ships were fitted with the improved Type 286P radar (with a rotating aerial) and 210 escort ships had Type 286M radar fitted. Radar on the convoy escorts significantly impacted the ability of U-boats to attack convoys using their preferred tactics, that is at night and on the surface.

The second system was High Frequency Direction Finding (HF/DF or 'Huff-Duff'). HF/DF was developed to locate U-boats by detecting their HF radio transmissions and provide a bearing to the transmitting U-boat. The first production system (FH2) went to sea in August 1941 and an improved version, the FH3, went to sea late in 1941. This system enabled U-boats to be located at far greater distances than using either Asdic or radar, and then sunk or driven off before they could get within range of a convoy.

And, late in 1941, aircraft in RAF Coastal Command began to be fitted with the improved ASV (Aircraft to Surface Vessel) Mark II radar, with a range of up to 36 miles. The sinking of *U-206* on 30th November 1941 was the first confirmed kill achieved by the use of ASV Mk II.

During the last three months of 1941, the number of U-boats operating in the Atlantic reached its lowest level.⁵² The British Official History, *The War at Sea*, states 'during the last two months of the year U-boat activity in the North Atlantic was at a low ebb'.⁵³

It is not possible to say definitively which of these factors was the most important in reducing the tonnages sunk from July 1941.⁵⁴ All certainly played a part. It is likely that the most important factors were the reduced number of U-boats operating in the Atlantic and the U.S. Navy's active involvement in the battle in an 'undeclared war'.

⁴⁹ Dönitz, *Memoirs*, page 159.

⁵⁰ Commander of U-boat Service.

⁵¹ Dönitz, *Memoirs*, page 159.

⁵² Dönitz, *Memoirs*, page 178.

⁵³ Roskill, Captain S.W., *The War at Sea 1939-1945, Volume I, The Defensive*, page 475.

⁵⁴ Kahn.

Sir Harry Hinsley has stated that 'It has been calculated that the Ultra saved about one and half million tons in September, October, November and December '41.'⁵⁵ It is not clear that this has actually been calculated. W.J.R. Gardner in his book *Decoding History, The Battle of the Atlantic and Ultra* wrote that 'This is stated in a number of places'⁵⁶, listing three of the places in a note. Significantly, in this note he wrote 'In none of these instances is the working revealed'.⁵⁷

Ralph Erskine in *Breaking Naval Enigma (Dolphin and Shark)* wrote '...one assessment that 1.5 to 2 million tons were saved in the second half of 1941 is over-simplistic.'⁵⁸ And W.J.R. Gardner concluded that '... the claim that 1.5-2 million tons was saved by Ultra in the second half of 1941 cannot survive proper scrutiny.'⁵⁹

Diverting convoys using Ultra was not always successful. On 8th October 1941, the Canadian escorted slow 50-ship convoy SC 48 had cleared the Belle Isle Strait. But during that night, Hut 8 decrypted a BdU signal ordering a Wolf Pack to converge on a location exactly on the convoy's route. Next morning the Canadian S.O.E. received an instruction from the Convoy & Routing Section in Washington (OPNAV 38S) to change the convoy's course in order to evade this Pack. On the morning of the 12th, Hut 8 decrypted further signals from BdU and the OIC concluded that BdU was trying to establish a patrol line across the course of SC 48.

Two hours after receiving this advice from the Admiralty, OPNAV 38S ordered the S.O.E. to turn SC 48 immediately southeast, and two hours later gave a new course for the convoy. On the 13th, BdU signalled a change of position for four U-boats but on the 14th this was known by the OIC. All seemed to be set for a cleverly planned and well executed diversion operation. But then, *U-553* came upon the convoy by chance early on the 15th, while moving up to the new patrol line BdU had ordered only a few hours earlier. Ultra could not prevent such chance contacts, even where the OIC had a reasonably accurate plot of the U-boat locations. BdU ordered nine U-boats to converge on the convoy. The attack on convoy SC 48 was very successful with nine merchant ships, a destroyer and a corvette sunk and a U.S. destroyer (the *USS Kearny*) severely damaged.⁶⁰

However, the diverting of convoys was not the only benefit that came from Ultra.

Another incalculable benefit of being able to read Hydra for so long was the insight which it had given us into the way the U-boat war was being conducted, and perhaps even into the way that Dönitz's mind worked. We knew the U-boats' methods, the average speed of advance when proceeding to or from patrol, the endurance of the various types of U-boat and characteristics of many of their commanding officers, the types of patrol lines favoured and the exact meaning of the short signals used for making sighting, weather or position reports. All this was something that

⁵⁵ Hinsley.

⁵⁶ Gardner, W.J.R., *Decoding History, The Battle of the Atlantic and Ultra*, 1999, Naval Institute Press, Annapolis, Maryland, page 172.

⁵⁷ Gardner, page 245.

⁵⁸ Erskine, page 2.

⁵⁹ Gardner, page 177.

⁶⁰ Rohwer, *The German View*, page 11.

would have taken much longer to discover, if it could have been achieved at all, if, we had not had the benefit of Special Intelligence.⁶¹

In November 1941, the German Navy introduced a simple substitution code into their Naval Grid Reference system (for example, that BF5718 became AO2699), and these codes were changed frequently.⁶² And, at the end of the month, Dönitz and his staff had conducted another enquiry into security. Convinced that there were other explanations for the failures of the U-boat force the U-boat Service concluded that the Enigma had not been broken, nor had there been any security leak from within the Service.⁶³

Ultra was also able on occasion to reveal the position of German surface raiders to the OIC. In November 1941, the raider *Atlantis* was returning home but was ordered to refuel U-boats in the South Atlantic. Her instruction to meet and refuel *U-126* was decrypted in Hut 8. The heavy cruiser *HMS Devonshire* was ordered to carry out a general search for raiders and supply ships in the area identified. On 22nd November, her Walrus aircraft sighted *Atlantis* and a U-boat. The U-Boat dived and escaped but the *Devonshire* opened fire from long range and sank the raider. The crew of the *Atlantis* radioed for help, and this and other messages were also intercepted and deciphered in Hut 8, revealing that two U-boats were ordered to rescue survivors and then to rendezvous with the supply ship *Python*. On 1st December another heavy cruiser *HMS Dorsetshire* sank the *Python* while she was attempting to refuel *U-68* and *U-A*.⁶⁴

There are references in the literature to the introduction of a new cipher, Triton, used by Atlantic U-boats as early as April 1941.⁶⁵ The Triton code was definitely in use by 5th October 1941 on the M-3 Enigma machine.⁶⁶ On 1st January 1942 a new edition of the Wetterkurzschlüssel came into force.⁶⁷ And also in January, a new edition of the Kurzschriftsignalheft was issued.⁶⁸ At the end of January 1942, all operational U-boats in the Atlantic under the direct control of BdU were switched to the Triton code (known as Shark by the Allies).⁶⁹⁷⁰

There is no clear statement in the literature on the difference between the Hydra code and the Triton code. One source mentions 'the more complex Triton code'⁷¹, another 'the intricate Triton

⁶¹ Beesly, Patrick, *Very Special Intelligence*, pages 156-157.

⁶² Beesly, *The British View*, page 7.

⁶³ Terraine, John, *Business in Great Waters*, Wordsworth, 1989, page 424.

⁶⁴ Beesly, *Very Special Intelligence*, pages 130-131.

⁶⁵ Alexander, page 34.

⁶⁶ Rohwer, *Radio Intelligence in the Battle of the Atlantic*, Proceedings of the Thirteenth Military History Symposium, U.S. Air Force Academy, Colorado Springs, Colorado, October 12 -14, 1988, page 83.

⁶⁷ Alexander, page 45.

⁶⁸ Rohwer, *The German View*, page 11.

⁶⁹ Beesly, *The British View*, page 6.

⁷⁰ Deutsch, Harold C., *The Historical Impact of Revealing The Ultra Secret*, Parameters Journal of the U.S. Army War College, page 21.

⁷¹ Russell, Commander Jerry C., *Ultra and the Campaign Against the U-boats in World War II*, Studies in Cryptology, NSA, Document SRH-142. Record Group 457, Records of the National Security Agency, page 5.

cipher'⁷² and yet another 'The new and more complicated Triton code'⁷³. But there are some fragments of information that can be found. Pages from a Triton code book can be found on the Internet.⁷⁴ An examination of these pages reveals that the Triton code was identical to the Hydra code with respect to the first three settings of the Enigma machine (the Walzenlage, Ringstellung and the Steckerverbindungen). Hugh Alexander wrote 'it was found that Shark [Triton] was using an entirely different Grundstellung [starting position for each rotor] from Dolphin [Hydra]'.⁷⁵ In Hydra, the Grundstellung was encoded using a bigram table and transmitted with the message. Upon receipt of the message the Grundstellung was decoded using the same bigram table. A page from an October 1943 edition of the Triton code shows that the Grundstellung is tabulated in the code book along with the other three settings. As it was no longer transmitted with the message it was much more difficult to crack.

Triton defeated the Hut 8 cryptographers until the first week in December 1942. This became known as the 'Shark Blackout'. Hut 8 did not hold a current edition of either the Wetterkurzschlüssel or the Kurzschriftheft and, therefore, had no cribs⁷⁶ for the bombes. Without cribs, the bombes were useless. Hugh Alexander wrote that 'the U-boat cribs were at this time extremely bad'.⁷⁷ A week after the blackout commenced, the OIC's Tracking Room was unable to say where the U-boats were.⁷⁸ However, Hut 8 did continue to decrypt Hydra and certain other ciphers, with varying delays. Hydra and Tetis were used by U-boats placed under the command of Gruppe Nord, the Naval Command in Norway, or those transferred to the Mediterranean or engaged in training in the Baltic. Intelligence could be gleaned from signals in Hydra to and from escort vessels concerning the activity of U-boats in and out of German, Norwegian and French ports and, from signals in Tetis, the Baltic U-boat training cipher, concerning U-boat numbers. But the OIC no longer had any information concerning the U-boats once they were at sea in the Atlantic.⁷⁹

And, simultaneously, the Germans had further wins in the battle of the cryptographers. The British Naval Cipher No. 3 was comprehensively broken by the xB-Dienst in February 1942. About 80% of signals to and between the Allied navies operating in the Atlantic were deciphered, including signals on convoy routings and diversions and signals outlining Allied beliefs on U-boat dispositions. But probably only about 10% were deciphered in time to be of use operationally, that is in directing Wolf Packs against convoys. The BAMS Code, which as noted earlier was an open book to the xB-Dienst from May 1940, was replaced in April 1942 by a new version. But, four weeks before this new Code was introduced, a copy of the code book was captured by the Germans from a merchant ship in northern Atlantic waters.

⁷² Deutsch, Dr Harold C., *The Influence of Ultra of World War II*, Parameters Journal of the U.S. Army War College, Vol. VIII, No.4, page 12.

⁷³ Rijmenants, Dirk, *Enigma and the U-boat War*, <http://users.telenet.be/d.rijmenants/en/enigmaboats.htm>.

⁷⁴ <http://users.telenet.be/d.rijmenants>

⁷⁵ Alexander, page 34.

⁷⁶ Crib - knowledge of the exact decode of all or part of a message.

⁷⁷ Alexander, page 45.

⁷⁸ Smith, page 109.

⁷⁹ Beesly, *The British View*, page 7.

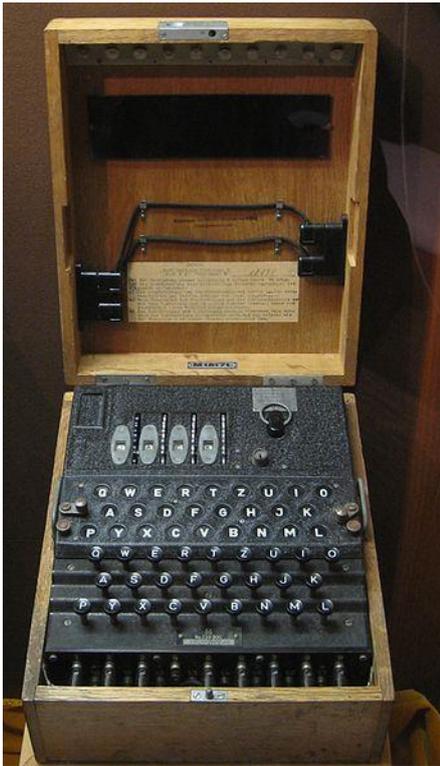


Figure 3 M-4 Enigma machine

Also some preparations had been initiated to improve the Enigma machine. At the same time as the Triton code came into force, the German Navy began introducing the four-rotor M-4 Enigma machine (see Figure 3).⁸⁰ However, the M-4 was not a true four-rotor machine. The fourth rotor (Beta) was the right-hand half of a split reflector and was not interchangeable with rotors I to VIII. Beta could be set as part of the message key, giving M4 the equivalent of 26 different reflectors, but M4's rotors could still only be mixed in 336 (8x7x6) different ways - not 3,024 (9x8x7x6).⁸¹

But the new editions of the *Wetterkurzschlüssel* and the *Kurzsignalheft* were not compatible with the M-4 Enigma machine.⁸²⁸³ The majority of messages were sent using these short signal codebooks⁸⁴, and the most important ones operationally.⁸⁵ Hugh Alexander wrote 'For various reasons - chiefly speed and desire to avoid our direction finders - the enemy wished to be able to send out information in as concise a form as possible, particularly when on operational duty.'⁸⁶

Therefore, the fourth rotor was not activated at this time for operational purposes.⁸⁷⁸⁸ And, as it took some time to equip all U-boats with the new machine⁸⁹, this allowed all U-boats, whether equipped with an M-3 or M-4 machine, to send messages to all other U-boats and receive messages from all other U-boats.⁹⁰ This was possible because if the M-4's fourth wheel was set up with its clip in Z and the letter A showing in the window, the effect of the new reflector plus the fourth wheel was exactly the same as that of the M-3 reflector.⁹¹ That is, the M-4 Enigma machine could emulate an M-3 Enigma machine.

There is much confusion in the literature concerning M-4 and Triton. It can be seen from the above that the Triton code and the M4 Enigma machine were not linked. There was no such thing as a Triton Enigma or a Triton M4 Enigma. Noting that new editions of the *Wetterkurzschlüssel* and the *Kurzsignalheft* that were not compatible with the M-4 Enigma machine were issued in January 1942 seems to confirm that the introduction of the Triton code and the M4 Enigma machine were not

⁸⁰ Beesly, *Very Special Intelligence*, page 238.

⁸¹ Erskine, page 3.

⁸² Alexander, page 45.

⁸³ Erskine, page 3.

⁸⁴ Nesbit, Roy Conyers, *Ultra Versus U-boats: Enigma Decrypts in the National Archives*, Pen & Sword Military, 2008, page 93.

⁸⁵ Alexander, page 43.

⁸⁶ Alexander, page 43.

⁸⁷ Beesly, *Very Special Intelligence*, page 238.

⁸⁸ Alexander, page 44.

⁸⁹ Beesly, *Very Special Intelligence*, page 238.

⁹⁰ Alexander, page 36.

⁹¹ Alexander, page 36.

even coordinated. The fact that they were introduced at the same time appears to be pure coincidence.

However, the Hut 8 cryptographers could foresee a time in the future when the fourth rotor on the M-4 Enigma would be activated. Consequently, a significant amount of effort was put into cracking the new machine. The only times during 1942 that the M-4 Enigma was used in four-wheel mode were a number of what Hut 8 referred to as '4 wheeled duds' - these were messages for which the fourth wheel had been mistakenly set elsewhere than at A⁹². These 'duds' enabled the wiring of the new reflector and wheel to be broken cryptographically as the operators had afterwards re-sent the message with the M-4 Enigma in M-3 emulation mode.⁹³ This had occurred before the blackout on 10th February 1942.

But the main effort was put into trying to break into Triton (Shark). Triton was only broken on three days until 13th December 1942 (February 23rd/24th and March 14th) which were broken - very laboriously – using cribs obtained from long messages sent also in Hydra (14th March was Dönitz' message to the German Fleet on his succeeding Admiral Raeder as Commander-in-Chief).⁹⁴

And then a breakthrough came via a 'pinch'. On 30th October 1942, off Port Said in the Eastern Mediterranean, five escorts forced *U-559* to the surface after nine hours of depth-charging. Within minutes the destroyer HMS *Petard* had raced alongside so that a boarding party was able to jump aboard and were soon inside searching for documents.

Similarly to the capture of *U-110*, there is some variance and lack of specifics in the literature concerning what cryptographic materials were recovered from the *U-559*. One source mentions 'the second edition of the Wetterkurzschlüssel'⁹⁵, another mentions 'a short signal codebook and the 1942 short weather cipher'⁹⁶, another 'the new weather code and some other cypher materials'⁹⁷ and still another 'codes for the Short Weather Cipher and the Short Signal Book'⁹⁸. So, it can be concluded that the third edition of the Wetterkurzschlüssel (not compatible with the M-4 Enigma) and the new edition of the Kurzsignalheft (compatible with the M-4 Enigma) were captured. A copy of the Triton codebook was not captured as this was a Mediterranean U-boat which used the Medusa code. An M-4 Enigma machine was also not captured (it was seen but not recovered)⁹⁹.

However, the material captured on *U-559* did not reach Bletchley Park until 24th November¹⁰⁰. The Wetterkurzschlüssel would provide Hut 8 with the cribs it needed to break into Triton (Shark). By

⁹² Mahon. A.P., *The History of Hut 8, 1939-1945*, United Kingdom at the National Archives, Kew, Richmond, Surrey, TW9 4DU. Reference HW 25/2, page 62.

⁹³ Alexander, page 36.

⁹⁴ Alexander, page 36.

⁹⁵ Erskine, page 3.

⁹⁶ Carper, page 34.

⁹⁷ Rohwer, *Radio Intelligence in the Battle of the Atlantic*, page 89.

⁹⁸ Wilcox, page 23.

⁹⁹ Harper, *Capturing Enigma, How HMS Petard Seized the German Naval Codes*, page 75.

¹⁰⁰ Sebag-Montefiore, Hugh, *ENIGMA, The Battle for the Code*, John Wiley & Sons, 2000, page 231.

2nd December Hut 8 believed it would soon be able to break Triton but had to wait until 8th December before the Meteorological Section in Hut 10 could provide the cribs¹⁰¹. (For a description of this process see Alexander¹⁰².)

On 22nd November 1942, Captain 'Jock' Clayton (a retired Rear-Admiral), the Head of the OIC, informed Bletchley Park that the U-boat campaign was:

the one campaign which Bletchley Park are not at present influencing to any marked extent - and it is the only one in which the war can be lost unless BP do help. I do not think that this is any exaggeration.¹⁰³

The Hut 8 cryptographers finally got back into Triton on 13th December. Patrick Beesly wrote in his book that 'Within an hour the first Triton messages started to come off the teleprinter and they continued to do so in an unending stream until the early hours of the following morning.'¹⁰⁴ Ultra was available again in the Battle of the Atlantic. However, like the second half of 1941, there were other factors that also contributed to the outcomes of the battle.

Between October 1942 and February 1943, the North Atlantic suffered the worst weather conditions experienced for half a century. Frequent hurricane-force winds whipped up towering seas. There were storms on 116 days out of 140, with gale force winds on 100 of these days. This period in the Battle of the Atlantic was known as the Endless Winter.

The last months of 1942 had been exceptionally stormy in the North Atlantic. But in January 1943 the elements seemed to rage in uncontrolled fury. Storm followed storm and very considerably enhanced the difficulties of U-boat operations. Stars remained invisible, and navigation became extremely difficult. There were often great gaps in the dispositions of the boats. Systematic search for shipping became impossible; and when it was located by luck, the weather gravely hampered attack. The foaming, raging seas which swept across the Atlantic in January 1943 were exceptionally high. The landsman must try and imagine for himself the rigours and hardships to which crews, and particularly those men on the bridge, were exposed. Secured by strong safety belts the officer and the men of the bridge watch had to suffer the tremendous buffets of every sea as they swept in cascades over the boat. Under such conditions only meagre success could be achieved.¹⁰⁵

Convoy commodores and escort commanders had good reason to hope that they might evade the enemy in such weather conditions. Out of seventeen ON, ONS, HX and SC convoys transiting the Atlantic in January, only three were intercepted by U-boats.¹⁰⁶ One of these convoys was HX 223, comprising 57 merchant ships and escorted by the American A-3 Group, which had departed New York on 14th January 1943. On 23rd January, B-Dienst gave BdU the course of this convoy. BdU sent fifteen U-boats to intercept and attack it southeast of Greenland. With the convoy only 150 miles

¹⁰¹ Erskine, Ralph & Smith, Michael, *The Bletchley Park Codebreakers*, Biteback Publishing, 2011, page 172.

¹⁰² Alexander, pages 43-45.

¹⁰³ Hinsley, F.H. et al., *British Intelligence in the Second World War, Volume II*, page 548.

¹⁰⁴ Beesly, *Very Special Intelligence*, page 207.

¹⁰⁵ Dönitz, *Memoirs*, page 316.

¹⁰⁶ Terraine, page 524.

from the patrol line, hurricane-strength winds with mountainous 60-foot waves descended on the combatants, blotting out all visibility. The convoy passed through the patrol line on the night of 24th January unseen and unharmed.¹⁰⁷

The OIC, in its January Anti-Submarine Report, warned that diverting convoys around U-boat patrol lines, on which the Admiralty had relied (supported by the daily Intelligence assessment produced by the OIC) during much of 1942, might no longer work:

It should be appreciated that with the growth of the operational U-boat force and the consequently greater areas covered by their patrols - which sometimes appear to approach ubiquity - the use of this method is limited and may soon be outworn ... The potentially annihilating superiority which the enemy, given a favourable strategic situation, might bring to bear on a convoy unlucky enough to be caught early on a homeward journey and far away from effective air cover cannot be appreciated by reference to any past experiences the critical phase of the U-boat war in the Atlantic cannot be long postponed.¹⁰⁸

[It should be noted that diverting convoys around U-boat patrol lines in 1942 was conducted without the benefit of Ultra for ten of the twelve months.]

And so it proved.

An example of this is convoy TM 1 which had departed Trinidad on 28th December 1942. The convoy consisted of nine precious tankers and was escorted by the British B-5 Group (Commander R.C. Boyle, S.O.E.). Ultra revealed that orders were issued on 2nd January 1943 to the *Delphin* Group to proceed westwards from their original patrol line to the mid-Atlantic, and then sweep south in company with a Milch Cow¹⁰⁹. Unfortunately Ultra was then 'blacked out' for seven days. The B-dienst was also unable to provide any intelligence regarding this convoy. It was therefore completely by accident that *U-514*, on the way to the West Indies, spotted TM-1 on the afternoon of 3rd January. *U514's* report had been detected and her position determined by direction finding (D/F). Although not decrypted at this time, the short signal used disclosed that it was a sighting report. The same afternoon, because of *Delphin*, the OIC ordered Boyle to divert sharply southward at dusk. However, Boyle decided to keep to his original course because he thought it would provide calmer weather for the mid-ocean refuelling of the escorts which would soon be necessary.

BdU now placed the *Delphin* Group in a line across the last known course of TM 1 on the off-chance that it might still be heading in the same direction. Dönitz had played a hunch, against the advice of his own staff. He was proved right because at 1500 on 8th January, TM 1 was sighted by *U-381*, the third last boat from the northern end of the line. Seven of the tankers were sunk and the other two were damaged. At dawn on 11th January, an RAF Sunderland flying-boat from Gibraltar appeared from the east and forced the U-boats to submerge. The Wolf Pack failed to regain contact. In this

¹⁰⁷ McKay, Ernest A., *Undersea Terror*, Julian Messner, 1982, page 124.

¹⁰⁸ Admiralty Anti-Submarine Reports, January 1943, vii, page 5.

¹⁰⁹ Type XIV tanker U-boat.

case the convoy was virtually annihilated despite Ultra revealing the orders to the *Delphin* Group and the OIC advising what should have been a successful diversion of the convoy.

On 30th January 1943, Admiral Karl Dönitz became Commander-in-Chief of the German Navy. He elected to remain as Flag Officer, Submarines, but incorporated his U-boat staff into the Naval High Command as Section II of the Naval Staff. He left the day-to-day conduct of U-boat operations to his Chief of Staff (FdU), Rear-Admiral Godt.

At the end of January there was yet another enquiry into security in the U-boat Service. Once more the Chief of the Navy Signals Department, Vice-Admiral Erhard Martens, confirmed that the Enigma ciphers were unbreakable, and this was accepted by Dönitz, Godt and the Section II staff.¹¹⁰

Convoy ON 166 which departed Liverpool on 11th February 1943 headed for New York is another example that diverting convoys around U-boat patrol lines was no longer as effective as it had been, despite the availability of Ultra. The convoy consisted of 63 merchant ships picked up mid-ocean by the American Escort Group A-3 commanded by Captain P.R. Heineman. The B-Dienst had discovered the route of ON 166 (the xB-Dienst had deciphered the convoy's instructions) and FdU deployed the patrol lines *Ritter* and *Neptun* to intercept. FdU's message to these U-boats was deciphered by Hut 8 and, using Ultra, the convoy was re-routed to the south. However, these new orders to Heineman were deciphered by the xB-Dienst and FdU formed a new patrol line *Knappen* south-east of the *Ritter* patrol line. With the naval Enigma traffic being read at this time with a 24-hour time delay, it was too late to do anything but fight.

One of the *Knappen* boats, the *U-604*, made contact with ON 166 at mid-day on 20th February. The attacks began on the night of the 21st February. In the morning of the 26th February the operation was broken off by the U-boats. Fourteen ships had been sunk and another seven damaged.

However, just as claims that Ultra was completely successful in diverting convoys are false, it would also be wrong to claim that Ultra was completely ineffective. There were also notable successes due to Ultra. B-dienst reported that a large Torch convoy inbound from the United States was to pass close to the Azores on about 17th February 1943. FdU deployed two groups, *Rochen* and *Robbe*, to intercept the convoy. Ultra had revealed the location of these two Wolf Packs and the convoy was successfully diverted around them.

Harry Hinsley in 1992 stated that '... Ultra had been solely responsible for the success of evasive routeing'.¹¹¹ This was not so. The OIC January Anti-Submarine Report mentioned earlier shows that diverting convoys around U-boat patrol lines had been relied on during much of 1942 when Ultra was not available. Also, while Ultra did divert a few convoys around identified Wolf Packs,

¹¹⁰ Terraine, page 525.

¹¹¹ Hinsley, Professor Harry, *The influence of ULTRA in the Second World War*, Annual Liddell Hart Centre for Military Archives Lecture, 18th February 1992.

there were also convoys which took successful evasive action without any input from Ultra. Convoy ON 170 which departed Liverpool on 3rd March 1943 headed for New York is an example of this.¹¹²

The convoy consisted of 51 merchant ships picked up mid-ocean by Escort Group B-2 commanded by Donald Macintyre. The convoy cleverly passed through the *Raubgraf* patrol line, aided by the skilful use of Huff-Duff. On 13th March at 1128, the sloop *Whimbrel* had picked up a radio transmission from *U-603*. Macintyre took *Whimbrel* and the corvette *Heather* along the bearing. The U-boat submerged as the two escorts approached. Keeping the U-boat submerged, Macintyre ordered the convoy to change course 40° to 180° (south). Macintyre then used *Heather* as a decoy. He ordered her to keep the U-boat down for at least one hour and then depart on a south-westerly course. Meanwhile, *U-435* had sighted *Whimbrel* and *Heather* and sent off a sighting report at 1320. *Whimbrel* picked up this signal and headed for the U-boat. *Heather* then reported at 1420 she had sighted the U-boat and it had submerged. *Whimbrel* then headed back to the convoy.

U-600 then sighted the convoy at 1800, signalling the convoy's location, course and number of merchant ships at 1843. *Whimbrel* picked up this signal and headed for the U-boat. Macintyre ordered the corvette *Gentian* to join him but they searched in vain until 1945. Macintyre had intended for the convoy to resume its south-westerly course but the Convoy Commodore persuaded him to maintain the southerly course until dawn. In addition, *Heather*, in her decoy role, was ordered not to approach the convoy and to fire star shells. The U-boats were fooled and did not find the convoy.

Of course, the diversion of convoys was not the only benefit of Ultra to the Allies in the Battle of the Atlantic. It provided insights into U-boat strategy and tactics. Even decrypts that were too late to be of operational value provided useful background information. And there were occasional references to improvements in U-boats and new weapon systems being developed or introduced into the U-boat force.¹¹³ However, Ultra was far from infallible. Naval Intelligence had kept a close watch for all evidence of progress by the Germans with regard to acoustic torpedoes. In January 1943, the Enigma decrypts contained reference to the FAT torpedo which shortly made its appearance. An error in interpretation made this out to mean Fernakustischtorpedo, ie a long-range acoustic weapon. This resulted in wasted research effort into a weapon that did not exist.

On 8th March 1943 a new edition of the Wetterkurzschlüssel came into force.¹¹⁴ On the same day, FdU ordered operational U-boats in the Atlantic to activate the fourth rotor on their M-4 Enigma machines for all messages¹¹⁵¹¹⁶, except possibly weather short signals¹¹⁷. Hut 8 decrypted this

¹¹² Costello and Hughes, page 267.

¹¹³ Sebag-Montefiore, page 243.

¹¹⁴ Dimpleby, page 400.

¹¹⁵ Costello and Hughes, page 263.

¹¹⁶ Beesly, *Very Special Intelligence*, page 238.

¹¹⁷ Mahon, page 83.

message which had been transmitted in three-rotor Enigma code and it revealed a German code word recognized as signifying the activation the fourth rotor on the M-4 Enigma machine.¹¹⁸¹¹⁹

On 9th March, Rear-Admiral John Edelsten, Assistant Chief of Naval Staff (U-boat Warfare and Trade), informed the First Sea Lord of the changed situation which could have had disastrous implications for the Battle of the Atlantic.

The foreseen has come to pass. The Director of Naval Intelligence reported on 8 March that the Tracking Room will be “blinded” in regard to U-boat movements for some considerable period perhaps extending to months.¹²⁰¹²¹

[The ‘foreseen’ can only have been the activation of the fourth rotor on the M-4 Enigma machine.¹²²]

This had occurred at a critical moment in the developing battle around convoy HX 228. This fast convoy of 60 merchant ships had departed New York on 28th February 1943 headed for Liverpool and was picked up mid-ocean by Escort Group B-3 (Commander Arthur Tait S.O.E.) and the U.S. 6th Escort Group, a Support Group, on 6th March. Thanks to Ultra, the Allied Tracking Rooms on both sides of the Atlantic had a good idea of the size and location of the U-boat patrol lines ahead of HX 228. Early on 8th March, COMINCH signalled HX 228 to change course to clear the *Raubgraf* patrol line.

xB-Dienst decrypts had given Section II of the Naval Staff (U-boat operations) the location and course of HX 228. Attempting to out-think the enemy, Section II put themselves in his place (a regular and often fruitful exercise). They assumed that the Allies would by now know where the U-boats were and re-direct the convoy to the north. They therefore replied by re-directing the *Raubgraf* Group to the north. Dönitz, in his memoirs, admits to personally making this ‘mistake’.

However, with Ultra now blacked out, the Tracking Rooms failed to pick up the new location of the *Neuland* Group in time to re-route HX 228. The convoy steamed across the north of this patrol line on 10th March. Later that day the U.S. 6th Escort Group had to turn for home to refuel. That night the U-boats struck, sinking four merchant ships and an escort. The battle ended with the arrival of VLR Liberators the next morning (three VLR Liberators in succession patrolled from 0930 to 2045 on 11th March, with five U-boats sighted and two attacked). The convoy arrived at Liverpool on 15th March without further losses. As can be seen, no ships were sunk whilst the escort carrier was with the convoy and no ships were sunk once the VLR Liberators arrived. There was an obvious conclusion!

The slow convoy SC 122 of 51 merchant ships departed New York City on 5th March 1943 headed for Liverpool and was picked up mid-ocean by Escort Group B-5 (Commander R.C. Boyle, S.O.E.) on

¹¹⁸ Rohwer, *The German View*, page 12.

¹¹⁹ Deutsch, *The Historical Impact of Revealing The Ultra Secret*, page 22.

¹²⁰ Costello and Hughes, page 263.

¹²¹ Beesly, *Very Special Intelligence*, page 238.

¹²² Beesly, *Very Special Intelligence*, page 238.

12th March. The fast convoy HX 229 of 38 merchant ships departed New York City on 8th March 1943 also headed for Liverpool and was picked up mid-ocean by Escort Group B-4 (Lieutenant Commander G.J. Luther, Acting S.O.E.) on 13th March. The xB-Dienst deciphered an Allied message and informed Section II that HX 229 had on the evening of 13th March been in a position south-east of Cape Race and steering a course of 89°. The following day the xB-Dienst deciphered another message containing the information that SC 122 had received orders to sail to a specified point and then steer a course of 67° across the Atlantic. Twelve U-boats were reformed into the *Raubgraf* Group and were immediately ordered onto a course where they might intercept the more easterly of the two convoys, SC 122. There was, of course, no Ultra at this time to reveal this to the Tracking Rooms.

But it was HX 229 that was sighted first by a U-boat. Over the next three days and nights the Wolf Pack sank 12 merchant ships. Some hundred or so miles ahead, the slow convoy SC 122 was also sighted and reported, and a Wolf Pack of 12 U-boats concentrated against it. As the two convoys closed up together, the two packs swamped the defences and caused heavy loss. Out of these two convoys alone 21 ships of 141,000 tons were sunk.

However, the fear that it might take weeks or even months to break the four-rotor Enigma were to prove premature. With a new edition of the Wetterkurzschlüssel now in use, the cryptographers could no longer get their cribs from this source. Fortunately, the new edition of the Kurzsignalheft (compatible with the M-4 Enigma) had been recovered from the *U-559* in October 1942. This could provide the new cribs, although they were less reliable than those obtained from the Wetterkurzschlüssel¹²³. Hut 8 concentrated its every resource and, unbelievably, in ten days found a solution to the problem. Although, at first, it took three to seven days to decode a signal. The three-rotor bombes available worked too slowly to check out the now-raised cycle length of the M-4 Enigma. It took the three-rotor bombes in use twenty-six times longer to go through the cycle length of a four-rotor signal than a three-rotor signal.¹²⁴ Fortunately, by March 1943 there were more than 60 three-rotor bombes available at Bletchley Park¹²⁵. However, the Official History, *British Intelligence in the Second World War*¹²⁶, states that complete mastery of Triton did not come until after the Battle of the Atlantic had been won in May 1943.

The number of U-boats operating on the North Atlantic convoy routes reached 60 in the first half of March.¹²⁷ Because of this it was extremely difficult to avoid contact.¹²⁸¹²⁹ Ultra intelligence remained largely ineffective even though after 20th March there was rarely serious interruption to the decryption of naval Enigma messages. However, the U-boat traffic was being read with about a 48 hour time delay¹³⁰, which was too long to be operationally useful. But, the B-Dienst, with superb

¹²³ Alexander, page 49.

¹²⁴ Hinsley, F.H. et al., *Volume II*, Appendix 19.

¹²⁵ Hinsley, F.H. et al., *Volume II*, Appendix 19.

¹²⁶ Hinsley, F.H. et al.

¹²⁷ Rohwer, *The German View*, page 12.

¹²⁸ Sebag-Montefiore, page 243.

¹²⁹ Russell, page 10.

¹³⁰ United States Navy, *World War II OP-20-G Final Report Series on the Battle of the Atlantic, Volume II*, p. 48.

efficiency, were able to provide FdU frequently, but not always, with decrypts of the Allied signals diverting convoys in time for Wolf Packs to be moved across to the new course of the convoy concerned.¹³¹ Ultra did make a few successful diversions possible, but the Wolf Packs made contact with a number of convoys and these conditions did not substantially change before the end of May.¹³²

Finally, the Admiralty realised that diverting convoys around the Wolf Packs using Ultra was not an effective tactic. On 22nd March 1943, a memorandum (AU (43) 90) by the First Sea Lord, Admiral Dudley Pound, was circulated to members of the British War Cabinet titled Anti-U-boat Warfare. In it Pound stated that 'We can no longer rely on evading the U-boat packs and, hence, we shall have to fight the convoys through them.'

In retrospect, this may be the single most important statement made regarding the Battle of the Atlantic. Without perhaps even the First Sea Lord himself fully appreciating it, the decision that the convoys were going to be defended much more vigorously, in a recognizable life-and-death struggle for control of the sea-lanes, gave the Allied side a much clearer focus than before.¹³³

But this required more air and sea escorts¹³⁴.

The Anti-U-Boat Warfare Committee had met on 12th November 1942 and made an important decision (against the stubborn opposition of its chair, Winston Churchill):

That the only solution to the air gap issue was to remove the thirty-three Liberators from the Bay of Biscay offensive, convert them to VLR standard, and allocate them to serve with 120 Squadron and the recently created 86 Squadron.

They were to be modified to VLR standards by the Scottish Aviation Company at Prestwick, at the rate of three a week. As it turned out, however, this proved to be an overly optimistic projection. By the end of March 1943 RAF Coastal Command only had 34 of these VLR aircraft in the Atlantic, of which only 20 were operational.

Following the successful conclusion of Operation TORCH, the escort vessels and escort carriers were released for duty in the Atlantic. This and new ships being delivered enabled the British to form five Support Groups at the end of March 1943 and the Americans formed another, the 6th Escort Group, in early March 1943 (to work under British control with the North Atlantic convoys).

The First Sea Lord's decision was shown to be correct. During March and April the Wolf Packs could not be consistently evaded despite the availability of Ultra. For example, in late April, HX 234 was diverted far to the north to avoid the *Specht* Group, which had attacked convoy HX 233. However, FdU formed a new group, *Miese*, from U-boats newly departed from the Biscay bases. On 20th April, the xB-Dienst decrypted an Allied radio message that HX 234 was proceeding east of

¹³¹ Beesly, *Very Special Intelligence*, page 239.

¹³² Haslop, Dennis, *Britain, Germany and the Battle of the Atlantic: A comparative Study*, Bloomsbury, 2013, page 211.

¹³³ Kennedy, Paul, *Engineers of Victory*, Random House, 2013, page 40.

¹³⁴ Sebag-Montefiore, page 243.

Newfoundland and northward toward Greenland to circumvent the *Miese* patrol line. FdU ordered 19 U-boats of the *Miese* Group northwest to a line across the convoy's new route. This message was not intercepted nor decrypted by the Allies¹³⁵. The convoy was found and attacked but only three merchant ships were sunk. Ultra did later reveal that 'the U-boats engaged have made repeated and bitter complaints about the ubiquity and efficiency of the aircraft which were constantly with the convoy on 24 April'¹³⁶. In March, 95 ships of 538,695 tons were sunk and in April, 44 ships of 252,533 tons (even though 'at the beginning of April there was a 'U-boat vacuum' in the North Atlantic'¹³⁷).

Using Ultra to divert convoys around the U-boat patrol lines remained largely ineffective through May 1943. This was principally due to two factors: the xB-Dienst continuing to be able to decipher the Allied signals faster than Hut 8 and OP-20-G could decipher the German Naval Enigma messages and, secondly, the large number of U-boats at sea in the North Atlantic (there were 126 on 10th May¹³⁸). However, at this time the decision to fight the convoys through was proving to be the winning strategy.

For example, Convoy HX 239 departed New York City on 13th May 1943. This was a particularly valuable convoy containing 42 merchant ships, including 11 tankers. It was picked up mid-ocean by Escort Group B-3 (Commander M.J. Evans, S.O.E.) and a Support Group, the 4th Escort Group (Captain A.K. Scott-Moncreiff), was with the convoy from 21st to 24th May. On 20th May, xB-Dienst deciphered a message giving the location and course of HX 239 and Group *Mosel* of 21 U-boats was formed to intercept it. Shortly afterward, the Hut 8 cryptographers read the FdU messages positioning *Mosel*, so Western Approaches Command ordered the convoy to alter course. But on 21st May xB-Dienst then deciphered that signal and FdU redirected no fewer than 22 U-boats to attacking positions. Hut 8 was not able to decode any of these messages until 22nd May. By which time the U-boats were in contact with the convoy. And the last of the messages was not decrypted until 3rd June.¹³⁹ Unfortunately for the U-boats, however, at that point they met the massed forces of Allied air and sea power in the Atlantic. No Allied ships were sunk from HX 239 while the Germans lost two U-boats.

On 17th May 1943, S.S. *Aymeric*, sailing in convoy ONS 7, was torpedoed and sunk. This was the last merchant ship to be sunk from a northern transatlantic convoy until mid-September 1943. On 22nd May 1943 Dönitz recalled his U-boats from the North Atlantic. He subsequently declared:

¹³⁵ Syrett, David, *The Defeat of the German U-boats: The Battle of the Atlantic*, University of South Carolina Press, 1994, page 43.

¹³⁶ Beesly, *Very Special Intelligence*, page 243.

¹³⁷ Dönitz, *Memoirs*, page 335.

¹³⁸ Beesly, *Very Special Intelligence*, page 244.

¹³⁹ Kennedy, pages 62-63.

Wolf-pack operations against convoys in the North Atlantic, the main theatre of operations and at the same time the theatre in which air cover was strongest, were no longer possible ... We had lost the Battle of the Atlantic.¹⁴⁰

The Battle of the Atlantic was not won during the course of May 1943 by the diversion of convoys around the Wolf Packs using Ultra. It was won through a series of decisive battles around convoys ONS 5, HX 237, SC 129, SC 130, HX 239 and ONS 7. 40 U-boats were sunk in May 1943 (33 in the first 22 days). It should be noted that between the middle of May 1942 and the end of May 1943, forty percent of North Atlantic convoys were intercepted by U-boat Wolf Packs¹⁴¹. Which means that 60% were not. Now, during this period Ultra was not available for seven months in 1942 (the Shark Blackout) and was not needed in January and February 1943 (the 'endless winter'), a total of 56% of the time. So, the maximum percentage of convoys that could have been successfully diverted using Ultra during this period is only 26%, just over a quarter.

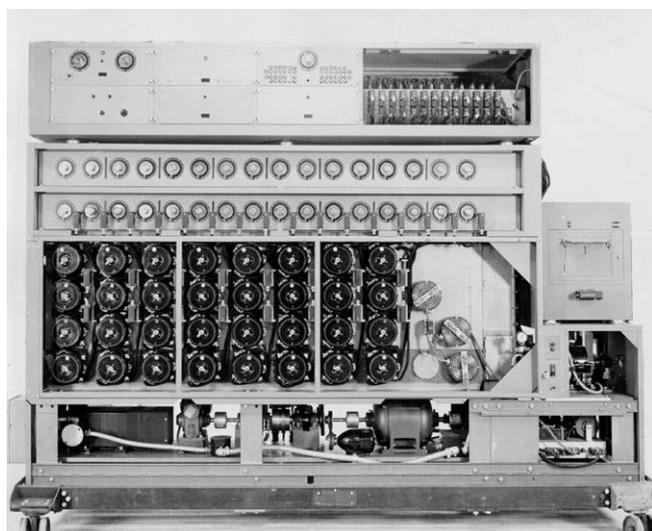


Figure 4 U.S. Navy bombe (National Security Agency)

The March blackout had emphasized how important it was to develop a system and machines for decrypting Triton that was not dependent on capturing German naval cryptographic material, particularly the short code books. The loss of cribs had blacked out Ultra in the Atlantic for 10 months of 1942. In fact, by the end of June 1943, the only way to break into the Triton messages was by machine¹⁴². British four-rotor bombes entered service in June 1943 and U.S. Navy four-rotor bombes in August (see Figure 4). However, in July and August it still took up to 26 days to

decrypt Triton messages. From September on, this was reduced to less than 24 hours, although there were still occasional problems.

While the weakness of combined British Naval Cipher No.3 was appreciated in some circles it was not until May 1943 that its compromise was so thoroughly demonstrated that action could be taken. In the middle of May 1943 the Germans offered the necessary proof of combined cipher compromise in the form of three Offizier messages to groups *Rhein*, *Elbe* and *Drossel* during the course of their patrol and action against convoys HX 237 and SC 129. Convinced that cipher compromise was involved, the Atlantic Section of the U.S. Navy's Division of Naval Intelligence gained access to Commander 10th Fleet Convoy and Routing files. The compromised Allied dispatches were identified and the evidence was submitted to Admiral Ernest King (COMINCH), who accepted the conclusions.

¹⁴⁰ Dönitz, *Memoirs*, page 341.

¹⁴¹ Beesly, *Very Special Intelligence*, page 248.

¹⁴² Wilcox, page 27.

An exchange of signals followed between COMINCH and the Admiralty involving proposals for additional security precautions, but the marked increase in similar compromise messages in German traffic toward the end of May led to the introduction of Naval Cipher No. 5 on 10th June 1943. Naval Cipher No. 5 was never broken by the xB-Dienst. So, the Allies could now read the German Naval Enigma but the Germans could no longer read the Allied signals.

On 1st July 1943 the German navy introduced a new fourth rotor and a new reflector, called respectively 'Gamma' and 'Cäsar', which could be interchanged with the existing fourth rotor, 'Beta', and the existing reflector, 'Bruno'. This resulted in another blackout of Triton. However, during this period the U-boats were largely absent from the North Atlantic. By the end of July the wiring for the new fourth wheel and reflector had been worked out cryptanalytically and it had been found that the Germans had made the mistake of using the same combination of rotor and reflector for the whole month. Once the new combination was worked out decryption of Triton proceeded as before for the remainder of the month.¹⁴³

For the next period in the Battle of the Atlantic Ultra became truly effective. For example, the U.S. Navy alone sank (or captured in two cases) 83 U-boats with the aid of Ultra intelligence¹⁴⁴. Although, it was not actually always quite as effective as you might believe from reading the 'published story'.

On 27th April 1943, Admiral King sent a highly classified message to Britain's First Sea Lord, Admiral of the Fleet Sir Dudley Pound, that stated:

While I am equally concerned with you as to the security of "Z" [i.e., Ultra] information it is my belief that we are not deriving from it fullest value[.] The refueling submarine is the key to high speed, long range U/boat operations[.] To deprive the enemy of refuellers [sic] would at once decrease the effectiveness and radius of entire U/boat deployment[.] With careful preparations it seems not unlikely that their destruction might be accomplished without trace[.]

Admiral King was pushing to use U-boat location information derived from Ultra to attack and sink the Germany Navy's supply U-boats operating in the Atlantic. These supply U-boats were either Type XIV 'Milch Cows' or Type XB minelayers being used as a supply boats.

Between 15th May and 28th October 1943, eleven of these U-boats were sunk.

Every historian accepted that Ultra had been responsible for the destruction of these supply U-boats. The story has appeared in numerous books and papers concerning Ultra and/or the Battle of the Atlantic. But none of these historians bothered to do the research to determine if there was

¹⁴³ Sebag-Montefiore, pages 271-272.

¹⁴⁴ *The Battle of the Atlantic, Appendix 16, U-boats Sunk by U.S. Forces with Aid of Radio Intelligence*, National Security Agency, Central Security Service. This Appendix include U-460 and U-487 which were later found to have been sunk without the aid of Ultra intelligence (see below).

any correlation between the two events. That is, until Clay Blair came along in the 1990s¹⁴⁵. He found a report prepared by the U.S. Navy's Operations Evaluation Group (OEG) in 1952 titled *Evaluation of the Role of Decryption Intelligence in the Operational Phase of the Battle of the Atlantic* (SRH-368). By examining this report, Table 2 can be constructed.

Table 2 – Killing the Milch Cows

U-boat	Date sunk	Enigma help	Sunk by	OEG Comment on Ultra Intelligence
U-463 ¹	15 th May 1943	No	RAF aircraft	Sailed from Bordeaux 12 May 1943, sunk in Biscay. No mention in messages.
U-118 ²	12 th June 1943	Very Good	USS <i>Bogue</i> aircraft	Very good. Messages giving her position for 8-9 June were decrypted 11 June – the day before the attack (see Section 4.3.1.)
U-119 ²	24 th June 1943	No	RN warships	Of doubtful value. 18/6 message (decrypted 23/6) gave probable rendezvous position at 44°N, 32°W for 21/6. Known to be returning. Sunk in Biscay.
U-487 ¹	13 th July 1943	No	USS <i>Core</i> aircraft	Not good. Messages on 23/6 (decrypted 6/7) and 25/6 (decrypted 3/7) gave position. Sunk 18 days after latter message.
U-459 ¹	24 th July 1943	No	RAF aircraft	No mention in message. Outward passage. Sailed 22/7 from Bordeaux.
U-461 ¹	30 th July 1943	No	RAAF aircraft	Nothing until report of attack on 30/7. Outward passage. Sailed 27/7 from Bordeaux.
U-462 ¹	30 th July 1943	No	RAF aircraft	Nothing until report of attack on 30/7. Outward passage. Sailed 27/7 from Bordeaux.
U-489 ¹	4 th August 1943	No	RCAF aircraft	Not mentioned in messages. Sailed 22/7 from Kiel, outward bound.
U-117 ²	7 th August 1943	Good	USS <i>Card</i> aircraft	Good. Two messages involving U-117, transmitted 7 days before the attack, were decrypted within 2 days. (See section 4.3.1.) (Sailed 22/7 from Bordeaux.)
U-460 ¹	4 th October 1943	No	USS <i>Card</i> aircraft	No decrypted message until 4/10 (decrypted 10/10) ordering rendezvous position.
U-220 ²	28 th October 1943	Very Good	USS <i>Card</i> aircraft	Very good. 26/10 (decrypted 27/1). No position. Mentions discontinuing provisioning because of heavy sea. 26/10 (decrypted 27/1) gives his position, says he is leaving square for 2 days. 27/10 at 1105A (decrypted 1815/27Z) BdU orders refuelling rendezvous. (Also a message from BdU giving R/V for U-486 at 37°N.,43°W. 27/10-2042 (decrypted 2350/27) orders 2 U-Boats to refuel from U-220.

Notes:

¹⁴⁵ Blair, Clay, *Hitler's U-Boat War, The Hunted, 1942-1945*, Random House, 1996, page 356.

1. Type XIV U-boat ('Milch Cow')
2. Type XB U-boat (minelayer being used as a supply boat)

As can be seen from Table 2, Ultra contributed to the sinkings in only three out of eleven cases. In particular, the four sinkings between 13th and 30th July were achieved despite the complete absence of Ultra for the first three weeks of the month. This was the longest single period where Triton was not broken other than the 'Shark Blackout' of 1942.¹⁴⁶ The claim that Ultra was responsible for the location and destruction of the 'milch cows' during this period simply cannot be sustained.

While Ultra was now effective that did not mean that the diverting of convoys around U-boat patrol lines was always successful. At the end of August, Dönitz was able to relax his order of 2nd August 1943 forbidding the sailing of any U-Boats, and after a three months absence, 21 of them took the fight once more out into the waters of the Atlantic. Dönitz pinned high hopes on their new equipment, the improved Hagenuk radar search receiver, the Zaunkönig (T5) acoustic homing torpedo, the Aphrodite radar decoy, the BOLD anti-sonar decoy and the heavily reinforced anti-aircraft armaments which they all now carried.

The slow convoy ONS 18 of 27 merchant ships (including MAC ship *Empire Macalpine*) had departed Liverpool on 12th September, headed for New York. It was picked up mid-ocean by Escort Group B-3 (Commander M. J. Evans, S.O.E.) on 14th September. The fast convoy ON 202 of 42 merchant ships had departed Liverpool on 12th September also headed for New York. It was picked up mid-ocean by Escort Group C-2 (Commander P.W. Burnett, S.O.E.) on 16th September. It was accompanied by a support group, the 9th (Canadian) Escort Group (Commander C.E. Bridgeman) from 19th to 25th September.

Despite Ultra being available for five of the first nine days of September, the Tracking Room was unable to locate the 21 U-boats which had recently left port. Very strict radio silence had been ordered and the U-boats were informed on 6th September that 'during the present waiting period' the main object was to avoid being detected.¹⁴⁷ So, no Ultra was available concerning these U-boats. On 15th September FdU formed the *Leuthen* Group from these 21 U-boats and issued orders to the Group to take up a patrol line by the evening of the 20th. The line was some 350 miles in length with its northern end about the same distance south-west of Iceland. This order was not decrypted until the 18th, but was of little use as FdU had used 'a new type of grid reference employing fixed points defined in the sailing orders of the U-boats'¹⁴⁸, which could not be 'decoded'. Unfortunately the Tracking Room estimated the position to fall about a hundred miles south of the actual line taken up by the *Leuthen* group, and although convoy ONS 18 was diverted it was not sufficient to keep it clear, nor was the faster ON 202, which was following behind and overtaking ONS 18, routed far enough north.

¹⁴⁶ Beesly, *Very Special Intelligence*, page 252.

¹⁴⁷ Beesly, *Very Special Intelligence*, page 262.

¹⁴⁸ Beesly, *Very Special Intelligence*, page 263.

At about 1900 on 19th September, ON 202 was sighted by *U-270*. The battle lasted until the early hours of 23rd September. Three escort ships and six merchant ships were sunk while the Germans lost three U-boats. Dönitz, however, believed the U-boats' reports of the destruction of twelve destroyers with the new acoustic torpedo and the sinking, in addition, of nine merchant ships by normal torpedoes. This was the last major success by the U-boat force against an Atlantic convoy.

Based on his inflated estimate of the losses inflicted by his U-boats on ON 202, Dönitz was optimistic of further successes against the next three convoys, ON 203, ON 204, and ONS 19. However, no ships were sunk in these convoys and three U-boats were lost. It has been written that these three convoys were successfully diverted using Ultra, and all slipped around the north end of the *Rossbach* (previously *Leuthen*) line¹⁴⁹. And, at the time, the Germans also believed this is what happened. However, this was not, in fact, the case. Contacts had been made but the U-boat commanders had not transmitted sighting reports due to the risk of being located by Huff-Duff and attacked. When this was discovered by FdU, the reaction came quickly in the form of a Current War Order (#4, 1035 and 1137/6/10):

The location of the convoy was the "chief problem of the U-boat warfare" and the responsibility rested on the U-boats themselves. Short signals for sighting reports were to be held ready for immediate transmission. Not even the slightest hint of the convoy's whereabouts might be withheld from Control.¹⁵⁰

Sometimes the decision was made not to divert a convoy around a U-boat patrol line based on Ultra but instead to steer the convoy directly through it. On 18th October 1943, the fast convoy ON 207 departed Liverpool headed for New York with 52 merchant ships (including the MAC ship *Amastra*). It was picked up mid-ocean by Escort Group C-1 (Commander J. A. Burnett, S.O.E.) on 19th October. Ultra had revealed the position of patrol line *Siegfried* of 18 U-boats. It was decided to force an engagement with the Wolf Pack. Several HX and SC convoys in the area were diverted away and ON 207 was massively reinforced by three Support Groups (2nd Escort Group (Captain Johnny Walker, in overall command), 7th Escort Group (Captain Lennox Boswell) and Escort Group B-7 (Commander Peter Gretton), including two escort carriers. The air and surface escorts overwhelmed the Wolf Pack. ON 207 continued to its destination, arriving at New York on 4th November 1943. No merchant ships in the convoy were lost but four U-boats were sunk.

More failures followed. On 12th November 1943, Dönitz ordered his U-boats to move about 350 miles in a south-easterly direction. It was against the north-south convoys from Freetown and Gibraltar that the main weight of this new offensive was directed. In this area, however, the Wolf Packs could be supported by long-range aircraft from Bordeaux. They were used to shadow Allied convoys during the day and reports of the air reconnaissance were passed on to the U-boats. FdU sailed thirty-seven upgraded Type VII and Type IX U-boats to groups *Schill*, *Weddigen* and *Borkum* to operate in a Central Atlantic triangle lying between the Bay of Biscay, Gibraltar and the Azores.

¹⁴⁹ Costello and Hughes, page 293.

¹⁵⁰ *German Naval Communication Intelligence, Battle of the Atlantic, Volume III* by OP-20-G, SRH-024, page 59.

Ultra revealed Dönitz' plans and the Allies massively reinforced the threatened area. Additional aircraft from RAF Coastal Command were sent to the Azores by the middle of November and Western Approaches Command moved four Support Groups (including Captain Johnny Walker's 2nd Escort Group) there. The U.S. Navy sent two US Hunter/Killer Groups based around escort carriers: TG 21.11 and TG 21.13. The U-boats sank only one merchant ship, the Norwegian *Hallfried*, and two destroyers. In return, eleven U-boats and about 550 men were lost.

Depending on the source, work on Triton (Shark) was transferred to Op-20-G sometime between the end of 1943¹⁵¹ and mid-1944¹⁵². This transfer of the work made sense as the U.S. Navy had so many bombs (in the last half of 1943 the U.S. Navy built 75 compared with four by the British), and they were faster and more reliable than the British bombs.¹⁵³

On 28th December 1943, Dönitz issued a new order (Current Order No. 34, December 1943) that radically modified the way U-boats were to attack convoys. Dönitz ordered FdU to cancel group operations and to scatter the boats at sea. These orders effectively ended the Wolf Packs. As the U-boats were unable to penetrate the air and surface escorts protecting the convoys, U-boats, upon gaining contact with a convoy, were henceforth to shoot FaTs and T-5s 'blind' from submerged positions without any use of the periscope. All five (or six) tubes were to be emptied in the attack.

U-264, the first U-boat fitted with a schnorchel to put to sea on an operational patrol, departed St. Nazaire on 5th February 1944. (Ultra had revealed progress with schnorchel trials in the Baltic as far back as December 1943.) The schnorchel enabled a U-boat to draw in fresh air and expel diesel exhaust gases while submerged and achieved the transformation from submersible craft to true submarine, removing the need to surface in order to charge the batteries. A U-boat could remain submerged for its entire patrol. However, this introduced a major disadvantage for both the Germans and the Allies. A submerged U-boat could neither transmit nor receive radio messages.

At the start of 1944, Dönitz had chosen to send the majority of his Atlantic U-boats to the western approaches to the British Isles. By the middle of January, FdU had stationed two dozen of them in a line stretching from the Faeroes in the north to Brest in the south, Group *Igel*. Ultra had revealed the deployment of Group *Igel* and the Allies massively reinforced the western approaches with Support Groups (including Captain Johnny Walker's 2nd Escort Group) and aircraft. Escort carriers were attached to all convoys passing through this area, and to the Support Groups. The Americans provided a Hunter/Killer Group based around the escort carrier USS *Block Island*. Over a period of four weeks, between 27th January and 24th February, the U-boats attempted to attack eight convoys but only succeeded in sinking one straggling merchant ship and one of Walker's sloops. Sixteen U-boats were sunk. Walker's Group alone accounted for six U-boats in a single patrol (including *U-264*).

¹⁵¹ Erskine, page 3.

¹⁵² Mahon, page 91.

¹⁵³ Erskine, page 3.

On 22nd March 1944, FdU dissolved Group *Preussen*, the last ever anti-convoy U-boat group (Wolf Pack). Dönitz had tacitly admitted defeat. He ordered the evacuation of a large area in the central Atlantic, the scene of his recent heavy losses, and cancelled all further operations against convoys. He told Hitler that they could not be renewed until the new types of U-boat (Type XXI and XXIII) were available. Meanwhile he built up the strength of the inshore groups in Norway and western France in accordance with Hitler's plans to deal with an Allied invasion of Europe. By 1st May only five U-boats remained scattered about in the North Atlantic. But the convoy escorts soon made what was virtually a clean sweep of the ocean. On 26th April and 11th June 1944, Ultra was directly responsible for the destruction of the last two Milch Cows, *U-488* and *U-490*.

On 1st June 1944, Dönitz issued orders that no U-boats should be sent into the Atlantic unless equipped with the schnorchel. At this time a blackout descended on U-boat communications. FdU was no longer organising Wolf Packs or patrol lines nor directing them against convoys. And U-boats were spending almost all their time submerged and, therefore, were unable to send or receive radio messages. The whole volume of German radio traffic in the Atlantic fell off¹⁵⁴. Patrol areas might sometimes be discovered from decrypts. But even this source of information began drying up. The Tracking Rooms on either side of the Atlantic found it difficult to glean the information they needed. There was simply nothing to intercept and decrypt and, therefore, no Ultra.

In addition the Germans introduced a change to their ciphering system. As far back as March 1944, the Admiralty Tracking Room had reported that 'two rendezvous... between a supply U-boat and two outward-bound 740 tonners and a torpedo carrier were ordered by U-boat control in a special cipher'¹⁵⁵. This was the Sonderschlüssel, a special one ship cipher for transmitting the more important operational orders to U-boats. This special cipher could not be broken. At least, not quickly enough to be of use. Captain Rodger Winn RNVR (Head of Submarine Tracking Room, Naval Intelligence Division, Admiralty) reported that:

the continued use of one ship cipher for transmitting the more important operational orders to U-boats has introduced a substantial element of hypothesis into the picture presented by the U-boat plot, and it has further transpired that a practice had been adopted - curiously enough as an innovation - by the enemy supplying to departing U-boats in their sailing orders all necessary patrol instructions which are accordingly supplemented or modified by W/T only so far as may become essential. The corresponding reduction in the value of Special Intelligence intercepts is substantial compared with the days when patrol orders were almost invariably despatched by W/T after a boat had sailed. In general communication with U-boats at sea has been progressively reduced as the U-boats now spend so much of their time submerged.¹⁵⁶

It took 5,300 bombe hours over about six weeks before Sonderschlüssel 161 succumbed in April 1945, and only three Sonderschlüssel were ever broken, all by OP-20-G. The widespread use of

¹⁵⁴ Beesly, *Very Special Intelligence*, page 327.

¹⁵⁵ Beesly, *Very Special Intelligence*, page 327.

¹⁵⁶ Beesly, *Very Special Intelligence*, page 327.

Sonderschlüssel from February 1945 virtually blacked out Ultra for all operational U-boats for the remainder of the Battle of the Atlantic.¹⁵⁷

Conclusions

It is clear that the key factor in breaking the naval Enigma, and therefore, the production of Ultra in the Battle of the Atlantic, was cribbing. When cribs were not available, for example in the first 21 months of the war and for ten months during 1942 (the Shark Blackout), the Hydra and Triton codes could not be broken and there was no Ultra. On the other hand, when cribs were readily available decryption was a routine, if sometimes time consuming, task. The Hydra and Triton codes themselves did not appear to present any difficulties. Similarly, the activation of the fourth rotor on the M-4 Enigma only blacked out Ultra for ten days in March 1943 (despite fears that this might extend to 'months'). It appeared to present few problems after this, except for some lengthy decryption times which were largely overcome by the introduction of the U.S. Navy's fast four-rotor bombes.

Evidently, had the German Navy been a bit more careful (for example, by the addition of 'padding' to messages, putting the information in short signals in random order or not re-transmitting U-boat weather reports in an easy to break cipher) the Hydra and Triton codes may never have been broken. Certainly, Tetis, Aegir, Neptun and Special Cipher 100 were never broken.

Did Ultra win the Battle of the Atlantic? Clearly no. There was no Ultra for the first 21 months of the Battle. Ultra was then available from June 1941 till early February 1942. It was a factor in reducing the tonnages sunk by the U-boats in this period but it has been shown in this paper that there were more important factors. Claims that 1.5-2 million tons of shipping were saved by Ultra in the second half of 1941 are over-simplistic and cannot survive proper scrutiny. There was then no Ultra from early February till the middle of December 1942 (the Shark Blackout). Ultra was then available through to the battle being won in May 1943. However, in this period the effectiveness of Ultra was largely cancelled out by the xB-Dienst continuing to be able to decipher the Allied signals faster than Hut 8 and OP-20-G could decipher the German naval Enigma messages and, secondly, by the large number of U-boats at sea in the North Atlantic.

The Battle of the Atlantic was not won during the course of May 1943 by the diversion of convoys around the Wolf Packs using Ultra. It was won through a series of decisive battles around convoys ONS 5, HX 237, SC 129, SC 130, HX 239 and ONS 7.

Ultra was certainly a factor in winning the Battle of the Atlantic, but it was not a major factor. The key factors that enabled the Allies to win the Battle of the Atlantic were:

The Liberty Ship Program (likely to be the single most important factor)

The Casablanca Conference's decision in January 1943:

The Battle of the Atlantic was made the highest priority for Allied resources

¹⁵⁷ Erskine & Smith, page 182.

The First Sea Lord's decision in late March 1943 that:

‘we can no longer rely on evading the U-boat packs and, hence, we shall have to fight the convoys through them’

More escort vessels allocated to the Atlantic

The formation of Support Groups

Improved Training

Western Approaches Tactical Unit

VLR Liberators

Type 271 radar for escort ships

HF/DF ‘Huff Duff’

Hedgehog

Escort Carriers

ASV Mk III for aircraft

Was Ultra a major factor in the destruction of the U-boat force between July 1943 and June 1944? Clearly yes. In this period Ultra was fully effective, as the move by the Allies to Naval Cipher No. 5 in June 1943 blinded the xB-Dienst for the remainder of the war. Ultra now enabled the Allies to deliberately provoke battles around selected, massively reinforced convoys, while diverting all other convoys safely away from the U-boat patrol lines. In these battles few merchant ships were sunk but a significant number of U-boats were sent to the bottom. The last major success by the U-boat force against an Atlantic convoy was in September 1943. However, the oft repeated claim that Ultra was responsible for the location and destruction of the ‘milch cows’ during this period simply cannot be sustained.

Twice Ultra allowed the Allies to counter Dönitz when he moved the Wolf Packs to a new area of operations during this period. Firstly, in November 1943 when he targeted the north-south convoys from Freetown and Gibraltar and secondly when he ordered a return to the western approaches in January 1944. The Allies massively reinforced these areas and the U-boats suffered heavy casualties and achieved minimal successes.

By late September 1943 the introduction of the American fast four-rotor bombes meant that the Triton code was read on all days of the month, and generally in 48 hours or less.

The last ever anti-convoy U-boat group (Wolf Pack), Group *Preussen*, was dissolved on 22nd March 1944.

From the middle of 1944 to the end of the war, Ultra largely disappeared from the Battle of the Atlantic. This was due to a combination of the use of the schnorchel and the introduction of the Sonderschlüssel, a special one ship cipher.

Select References

Alexander, C.H.O'D., *Cryptographic History of Work on the German Naval Enigma*, HW 25/1, Government Code and Cypher School: Cryptographic Studies, 1946.

Beesly, Patrick, *The British View*, a paper presented at the Naval Symposium at the U.S. Naval Academy in Annapolis on October 28, 1977.

Beesly, Patrick, *Very Special Intelligence, The Story of the Admiralty's Operational Intelligence Centre in World War II*, Sphere Books, 1977.

Costello, John and Hughes, Terry, *The Battle of the Atlantic*, Collins, 1977.

Dönitz, Karl, *Memoirs, Ten Years and Twenty Days*, Cassell, 1990.

Erskine, Ralph, *Breaking Naval Enigma (Dolphin and Shark)*

Gardner, W.J.R., *Decoding History, The Battle of the Atlantic and Ultra*, 1999, Naval Institute Press, Annapolis, Maryland.

Hinsley, F.H. et al., *British Intelligence in the Second World War*, three volumes, HMSO, London, 1979-83.

Rohwer, Jürgen, *The German View*, a paper presented at the Naval Symposium at the U.S. Naval Academy in Annapolis on October 28, 1977.

Terraine, John, *Business in Great Waters*, Wordsworth, 1989.