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Introduction

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INTRODUCTION

The Battle of the Atlantic in the Second World War saw the establishment of one of the first modern systems for the collection, analysis and dissemination of intelligence. Gone were the days when intelligence was produced by essentially amateur staffs who sifted through agents' and travellers' reports, newspapers, naval attachés' dispatches and the like.[1] These were replaced by super-secret organizations employing worldwide electronic systems of collection and communications. In this new world of intelligence, human sources of information, with the exception of prisoners-of-war, would be replaced by the electronic intercept station. Information collected electronically would be dispatched to centralized staffs who employed machines and electronic devices to analyse raw information and produce usable intelligence that was sent electronically to users. The intelligence agencies created by the British and Americans to fight the Battle of the Atlantic during the Second World War were the forerunners of organizations such as the National Security Agency and the Government Communications Headquarters.

Historians were largely oblivious to the rise of modern intelligence techniques until 1974 when F.W. Winterbotham published *The Ultra Secret*[2] and disclosed for the first time that during most of the Second World War the Allies had been reading the coded command radio communications of the German armed forces. Further, the Allied ability to read coded German command radio communications was at the 'hub of the whole Atlantic Battle', for it gave the Allies access to 'not only many of the instructions to U-boats at sea but also to gain accurate knowledge of their positions from signals they sent in order to keep their own naval operations people informed of their whereabouts.'[3] Winterbotham's book both astonished and disconcerted historians of the

[1]Cf. Jeffrey M. Dorwart, *Conflict of Duty: The U.S. Navy's Intelligence Dilemma, 1919–1945* (Annapolis, Md., 1983)

[2]F.W. Winterbotham, *The Ultra Secret* (New York, 1974)

[3]Winterbotham, *The Ultra Secret* p. 84

Second World War,[4] for if *The Ultra Secret*'s revelations were correct, the whole history of the conflict might have to be rewritten.[5] Because of the crucial importance of the revelation of the existence of Ultra to the conduct of the Battle of the Atlantic, naval history might well have to be rethought and recast to integrate communications intelligence into the analysis of the conflict.[6]

Communications intelligence was the most important source of information for the Allies on the activities of German U-boats during the Battle of the Atlantic. During the course of the Second World War, the Allies monitored, intercepted, and decrypted thousands of German coded radio messages to and from U-boats – the US Navy alone was responsible for deciphering more than 49,000 such transmissions.[7] Perhaps never before had one side in a conflict learned as much about their foes as the Allies did about

[4]Cf. David Syrett, 'The Secret War and the Historians', *Armed Forces and Society* (Winter, 1983), vol. 9, pp. 293–328.

[5]Cf. Harold C. Deutsch, 'The Historical Impact of Revealing the Ultra Secret', *Cryptologic Spectrum* (Winter, 1978), vol. 18, pp. 17–29.

[6]The best account of breaking the German U-boat codes is David Kahn, *Seizing the Enigma: The Race to Break the German U-Boat Codes, 1939–1943* (Boston, 1991). F.H. Hinsley, *et al*, *British Intelligence in the Second World War* (London, 1979–1988) is an overview of the role of intelligence in the Battle of the Atlantic. Histories of the Battle of the Atlantic from the point of view of communications intelligence can be divided into several groups. First there are those like the British and American official histories by S.W. Roskill and S.E. Morison which were written without a knowledge of Allied code breaking.

This is also the case with the most authoritative German account in English of the North Atlantic campaign, Gunter Hessler's *The U-Boat War in the Atlantic, 1939–1945* (London, 1989), written for the British Ministry of Defence before the 'Ultra' disclosures and published some years later. A second group includes studiesh such as Dan van de Vat, *The Atlantic Campaign: World War II's Great Struggle at Sea* (New York, 1988); John Terraine, *The U-Boat Wars, 1916–1945* (New York,h 1989); and Correlli Barnett, *Engage the Enemy More Closely: The Royal Navy in the Second World War* (London, 1991) – surveys dealing with communicationsh intelligence only in very general terms. A third category includes books such as Ralph Bennet, *Behind the Battle: Intelligence in the War with Germany, 1939–1945* (London, 1994), pp. 168–201, which attempts to assess the general impact of communications intelligence on the Battle of the Atlantic. Indeed, there are few worksh which show in any depth the actual role of communications intelligence, includingh information from decryption. Two Canadian studies – W.A.B. Douglas, *The Creation of A National Air Force* (Toronto, 1986) and Roger Sarty, 'Ultra, Airh Power, and the Second Battle of the St Lawrence, 1944', *To Die Gallantly: The Battle of the Atlantic*, Timothy Runyan and J.M. Copes, eds. (Boulder Co., 1994),h pp. 186–209 – are among the few to show effectively how an Allied force, theh Royal Canadian Air Force in the Northwest Atlantic during the last years ofh the war, used communications intelligence to hunt U-boats. And this author's *Defeat of the U-Boats: The Battle of the Atlantic* (Columbia, S.C., 1994) shows theh role of communications intelligence in defeating the U-boats in the North Atlantich convoy battles during 1943.h

[7]NA, SRGN-001/49668h

the German U-boats during the Battle of the Atlantic. An extreme position taken by one historian was that communications intelligence 'gave the Admiralty an unprecedented overall view of the enemy's naval operations and intentions.'[8] But if the Allies had all-embracing knowledge of the operations and intentions of the enemy, then how did the U-boats sink 2,828 Allied merchant ships totalling 14,687,231 tons during the years 1939–1945?[9] Part of the answer to this question lies in the fact that without proper weapons and the correct strategy and tactics, intelligence alone cannot win battles. Nearly as important are intelligence's limitations: the way and manner in which information is obtained as well as the way that this intelligence is actually used will affect the outcome of a battle.

There were four principal ways in which the Allies exploited German radio communications to and from U-boats. One was the location of the source of the radio transmission by direction finding (D/F). Another was obtaining the contents of a coded radio message through decryption.[10] Information on individual U-boats could also be amassed by identifying a radio operator's Morse and the electronic characteristics of individual radio sets.[11] A fourth source of intelligence from radio transmissions is known as radio traffic analysis – the study of radio call signs, networks, signals, and the like, together with D/F.[12] For example, from the type, 'length of dispatch' and other characteristics of a radio transmission, the Allies could tell if a U-boat radio message was a sighting, sinking, contact, position, reconnaissance or weather report. At the beginning of the Second World War the *Befehlshaber des Unterseeboote* (BdU), the German Commander-in-Chief of U-boats, knew that the logical possibility existed that the Allies could obtain intelligence from radio transmissions to and from U-boats. However, the BdU office discounted the security dangers inherent in all radio communications and adopted a command and control system for U-boats at sea which required a great

[8]John Winton, *Ultra at Sea* (London, 1988), p. 1.

[9]S.W. Roskill, *The War at Sea, 1939–1945*, (London: HMSO, 1954–1961), vol. III, part II, p. 479.

[10]NA, SRH-367, 'Battle of the Atlantic, A Preliminary Analysis of the Role of Decryption Intelligence in the Operational Phase of the'. OEG Report 66, 20 August 1951.

[11]These two processes are known as TINA and radio fingerprinting.

[12]Hinsley, *British Intelligence*, vol. I, p. 21.

number of radio transmissions.[13] The BdU thought, incorrectly, that the Enigma code machine produced codes so complex that the Allies could never decrypt a message encoded by this method in time to be of operational use.[14] The BdU also firmly believed that it was nearly impossible for the Allies to intercept, monitor, and D/F extremely short high-frequency radio transmissions systematically and accurately.[15]

It was only after the Second World War that the Germans learned that the Allies had developed the technology not only to intercept and D/F their radio transmissions but also to read their coded radio communications. At various times the BdU concluded that there was a leakage of information about U-boat operations to the Allies.[16] From time to time they even advanced various theories, such as an Allied wiretap on phones in Norway used by the U-boat service.[17] This was a major intelligence failure. Indeed, the reasons that the BdU and other German command and intelligence authorities failed to recognize the possibility that the Allies could develop the technology to intercept and D/F high frequency radio transmissions and break complex codes are obscure.[18] And this oversight by the Germans is even harder to understand in light of the significant role communications intelligence played in the defeat of the U-boats in the First World War.[19]

The Allied Intercept System

To exploit their knowledge of German U-boat radio communications, the Allies established a string of radio intercept stations around the coasts of the Atlantic Ocean. When the Allied intercept system was fully established, it consisted of fifty-one stations manned by Americans, Britons and Canadians.[20] At first these

[13]Karl Doenitz, *Memoirs: Ten Years and Twenty Days* (New York, 1959), pp. 62–63.

[14]Jurgen Rohwer, 'Ultra and the Battle of the Atlantic: The German View', *Changing Interpretations and New Sources in Naval History*, ed. Robert William Love, Jr. (New York, 1980), p. 420–421.

[15]Doenitz, *Memoirs*, p. 63.

[16]E.g., Hessler, *The U-boat War in the Atlantic*, vol. I, pp. 77–79.

[17]Public Record Office (PRO), DEFE 3/738, intercepted 1040/9/11/44 decoded 1355/9/11/44.

[18]Cf. David Kahn, *Hitler's Spies: German Military Intelligence in World War II* (New York, 1978), pp. 523–543.

[19]Cf. R.M. Grant, *U-boat Intelligence, 1914–1918* (New York, 1969).

[20]NA, SRH-277, A Lecture on Communications Intelligence by RADM E.E. Stone, 5 June 1951.

intercept stations were equipped with pre-war types of D/F sets, but as soon as the equipment became available, they were re-equipped with modern high-frequency direction-finder [HF/DF] sets to facilitate the interception and D/Fing of German high-frequency radio transmissions. The Allied radio intercept stations had two main tasks. One was to obtain an accurate coded text of a radio transmission to or from a U-boat. The second was to obtain a bearing on the source of a radio transmission. As radio transmissions to and from U-boats were high-frequency and of very short duration it took special equipment and skills to intercept these signals and determine their point of origin. The problem confronting the Allies, in 1939 and later, was the slowness and great difficulties encountered in assembling the skilled manpower and specialized equipment required to establish the necessary shore-based radio intercept stations throughout the Atlantic.

Most Allied intercept stations were equipped with modern HF/DF sets which could obtain bearings on a variety of brief high-frequency radio transmissions as quickly as possible.[21] These HF/DF sets 'operated automatically and gave instantaneous bearing indications.' Nevertheless, the accuracy of a D/F fix depended on the skill of the HF/DF set operator and the state of the weather and the ionosphere. With six or seven D/F bearings or 'cuts', as they were called, obtained by different shore-based intercept stations it was possible to plot at long-range the location of a U-boat transmitting at sea within twenty-five or thirty miles.[22] Even though 'Fixing a position was more an art than a science,'[23] properly equipped and manned shore-based radio-intercept stations enabled the Allies to use D/F to approximate the location of a U-boat transmitting radio signals at sea. Accurate D/F fixes were of vital importance to the Allies in fighting the Battle of the Atlantic.[24]

When the system was fully developed, Allied radio intercept stations were connected to either London, Ottawa or Washington, DC, by high-speed secure electronic communications systems. By the end of the war it took six minutes from the time of transmission for a D/F bearing to reach the Atlantic Section, Combat Intelli-

[21]NA, SRH-197, US Navy Communications Intelligence Organization, Liaison, and Coordination, 1941–1945.

[22]Kahn, *Seizing the Enigma*, p. 145.

[23]NA, SRH-277, A Lecture on Communications Intelligence . . .

[24]NA, SRMN-032, Memoranda Concerning U-Boat Tracking Room Operations, 2 January 1943–6 June 1945, f. 098.

gence in the Office of COMINCH (Commander-in-Chief, US Fleet) in Washington, DC.[25]

At the end of 1942 responsibility for intercepting and D/Fing U-boat radio traffic and disseminating the intelligence thus obtained was divided three ways. The United States was responsible for the Atlantic south of 40°N, Canada for the western North Atlantic, and Britain for the eastern North Atlantic.[26] It is clear from the existing documentation that the Allies established a very effective network to intercept and D/F radio transmission from U-boats, but the documentary record is less clear as to just how D/F fixes and radio-traffic analysis fitted into the total Allied intelligence picture of German U-boat operations. One of the problems is that information actually obtained from decryption of German radio messages is often cited as D/F information.[27]

Of much greater importance than shore-based D/F as a source of intelligence to the Allies in the Battle of the Atlantic was decryption of German coded radio messages. The great value of decryption-based intelligence was that it allowed the Allies to know what one German was saying to another German. As long as the Germans were unaware that the Allies were reading their coded radio messages, there could be no possibility of deception. In other words, the contents of a decrypted message depicted what the sender thought to be the truth. Decryption intelligence thus came from the horse's mouth.

Moreover, the decryption of enemy radio messages presented Allied intelligence officers with none of the problems of the information obtained from reports of spies. Spies do not see everything, nor do they always understand what they see. Nor do spies always tell their employers the truth and they usually have great difficulty transmitting information to their masters in timely fashion.[28] For a spy to obtain the information which the Allies got from decryption intelligence about German U-boat operations he would have had to be a trained staff officer, directly linked by radio to the Admiralty in London, standing twenty-four hours a day at the BdU's operational plot, the chart tracing the movements of U-boats and

[25]NA, SRH-197, US Navy Communications Intelligence . . .

[26]Wesley K. Wark, 'The Evolution of Military Intelligence in Canada', *Armed Forces and Society* (Fall, 1989), vol. 16, p. 84.

[27]Kenneth Knowles, 'Ultra and the Battle of the Atlantic: The American View', *Changing Interpretations and New Sources in Naval History*, ed. Robert William Love, Jr. (New York, 1980), pp. 445–446.

[28]Cf. Sir David Hunt, *Don at War* (London, 1990), pp. 240–241.

Allied ships and convoys. Finally, decryption intelligence went directly from the Germans to the Allies without the possibility of distortion in the collection or transmission.

The British first broke the codes used by the German navy in 1941. By 4 August 1941 they were regularly reading coded radio messages to and from German U-boats with some delays.[29] The British code named this system 'Dolphin' and the intelligence from Dolphin was apparently used regularly to reroute convoys to avoid contact with the U-boats.[30] It is believed that decryption intelligence made encounters between British convoys and U-boats in the last half of 1941 largely fortuitous. One historian has even estimated that during this period the British avoided shipping losses which could have amounted to 1.5 to 2 million tons. It is also known that the British passed intelligence from decrypted U-boat radio messages to the Americans and that this information played a part in the formation of United States policy in the North Atlantic before Pearl Harbor and alerted the Americans to the presence of U-boats in American waters in 1942.[31]

This intelligence bonanza ended on 1 February 1942 when the Germans instituted a new code, called 'Shark' by the British, which employed a fourth wheel in addition to the three used in a standard Enigma code machine.[32] For months Shark remained impervious to the best efforts of the British code breakers. In this period, known as the 'Great Blackout', the British could read only the Dolphin messages used by the Germans for naval operations in the Baltic, Arctic and Western European coastal waters.[33] Worse still, it was at this time that the Germans broke the British code Combined Cypher 3. Even though the Germans were able to read only about 10 per cent of the traffic in this code, they were able to establish the Allied convoy schedules as well as to obtain a mass of other information which permitted U-boats to gain a number of successes against Allied shipping in the North

[29]Jurgen Rohwer, 'The Wireless War', *The Battle of the Atlantic, 1939–1945: the 50th Anniversary International Naval Conference*, ed. Stephen Howarth and Derek Law (London, 1994), p. 411.

[30]Hinsley, *British Intelligence*, vol. II, pp. 163, 663. The decrypts of U-boat radio messages for 1941 can be found in PRO, DEFE 3/1–4, 20–34.

[31]Jurgen Rohwer, 'The Operational Uses of "Ultra" in the Battle of the Atlantic', *Intelligence and International Relations*, eds. Christopher Andrew and Jeremy Noakes (Exeter, 1987), pp. 283–284. Michael Gannon, *Operation Drumbeat* (New York, 1990), pp. 149–190.

[32]Hinsley, *British Intelligence*, vol. II, p. 179.

[33]Hinsley, *British Intelligence*, vol. II, pp. 663–664.

Atlantic.[34] One of the bright spots for the Allies in the electronic war in the North Atlantic during 1942 was the development and deployment of ship-borne HF/DF.[35] From the autumn of 1942 most Allied escort groups had at least one ship equipped with HF/DF which enabled the convoy escorts to obtain and then run down a bearing on the radio transmission of a U-boat that had reported the convoy to the BdU. Once the location was determined, the escort could force the enemy vessel to dive and lose contact. The German failure to learn of ship-borne HF/DF was another of their great intelligence failures in the Battle of the Atlantic.[36] However, ship-borne HF/DF was only a device to assist the Allies in fighting convoy battles and was no substitute for reading the U-boat command radio communications.

Not until 13 December 1942 would the British once again be able to decode German U-boat radio messages from the Atlantic Ocean.[37] By the time that they began to read radio messages encoded in Shark systematically, the U-boat war had entered its decisive phase for the Allies. German operations had shifted away from American waters to the convoy routes of the North Atlantic where groups of U-boats, known as wolf packs, now successfully attacked convoys running between North America and Great Britain. In a battle of March 1943 involving Convoys SC 122 and HX 229, there were seventy-five encounters between the Allied forces and the U-boats. The Allies lost twenty-two ships,[38] and they could not continue to sustain losses at this rate.

The Allies had to win the convoy battles in the North Atlantic in 1943, for defeat could have incalculable results. If the U-boats were not defeated in 1943, the Allied offensive in the Mediterranean might fail, aid to Russia would have been impossible and there would have been no invasion of Northwest Europe in 1944. But none of these dire possibilities came to pass, because the Allies did defeat the U-boats in the North Atlantic by the end of

[34]Rohwer, 'The Wireless War', p. 413.

[35]Ship-borne HF/DF was developed simultaneously but independently by both the British and the Americans. Kathleen Broome Williams, *Secret Weapon: U.S. High-Frequency Direction Finding in the Battle of the Atlantic* (Annapolis, MD, 1996).

[36]Rohwer, 'The Wireless War', p. 413.

[37]Hinsley, *British Intelligence*, vol. II, p. 233.

[38]Jurgen Rohwer, *Critical Convoy Battle of March 1943* (Annapolis, Md., 1977), pp. 197–198.

1943. Communications intelligence, including decryption of enemy radio messages, was pivotal to that Allied victory.[39]

The texts of coded radio messages to and from U-boats intercepted by the British were sent from the intercept stations to the Naval Section of the Government Code and Cypher School at Bletchley Park north of London for decoding. After being translated into English the texts of the German messages were sent by teleprinter to the Submarine Tracking Room in the Operational Intelligence Centre at the Admiralty in London.[40] It was the task of the Submarine Tracking Room to analyse each decrypted U-boat radio message and to combine the information it contained with other intelligence materials, such as the results of prisoner-of-war interrogations, photo reconnaissance, U-boat sightings and D/F fixes to produce a total intelligence picture which was then dispatched to the command authorities with its sources hidden. The Submarine Tracking Room consisted of a very small staff, commanded until the end of 1940 by Paymaster Captain Ernest W.C. Thring, RN, and then by Commander Rodger Winn, RNVR.

In reading about the phenomenon of Ultra one can get the impression that reading decrypts was similar to reading a cook book or shopping list. However, nothing can be further from the truth: decrypts of intercepted U-boat radio messages were complex documents and did not always yield information easily. For example, the Submarine Tracking Room received the following intercepted U-boat radio message from Bletchley Park:

ADM
TOID 8 G ZIP/ZTPGU/7099
FROM NS
2260 KC/S TOI 1129/25/2/43

TOO 1156

FROM LUIS
AM IN CONTACT IN THE NIGHT DIVED FOR DESTROYER. 30 CUBIC METRES. CORVETTE IS PREVENTING MY GETTING AHEAD.

2130/25/2/43[41]

[39]Cf. Syrett, *The Defeat of the U-Boats*.

[40]PRO, DEFE 3/705–744 contain the decrypts from U-boats in the Atlantic from December 1942 until the end of the war. PRO DEFE 3/340–499 contain scattered decrypts from U-boats in the Arctic and Baltic. For an account of the Operational Intelligence Centre see, Patrick Beesly, *Very Special Intelligence: The Story of the Admiralty's Operational Intelligence Centre, 1939–1945* (London, 1977).

[41]PRO, DEFE 3/712, intercepted 1129/25/2/43 decoded 2130/25/2/43.

Here 'NS' identified the document as a teletype sent from Naval Section. Government Code and Cypher School, 2260 KC/S was the radio frequency used by the Germans to transmit the message and 'TOO 1156' was the time of origin of the German signal in the German time zone. 'ZIP/ZTPGU/7099' is a designation indicating decoded material and the consecutive serial number of the teletype. 'LUIS' was the surname of the commander of the U-504 who originated the message to the BdU. 'TOI 1129/25/2/43' indicates the time at which the message was intercepted in the British time zone, which can be either GMT, British Summer Time, or Double British Summer Time, while '2130/25/2/43' was the time of origin of the teletype from Bletchley Park. Finally, '38 CUBIC METRES' is the amount of fuel on board the U-boat.

This decrypted message is from the U-504 to the BdU, but the sender is identified by the surname of the commander of the U-boat instead of the vessel's number, a security device used by the Germans in all their radio communications.[42] The movement of commanding officers from one U-boat to another often caused problems in establishing the order of battle of the U-boat fleet and the identity of individual U-boats, but this was overcome by keeping track of the comings and goings of U-boat commanders as well as the Morse characteristics of individual U-boat radio operators and the electronic peculiarities of U-boat radio transmitters.

Of much greater importance to both historians and intelligence officers is the time lag or delay between the time of intercepting the radio message and the time of its decoding. The above message from the U-504 was intercepted at 1129 on 25 February 1943, but it was not decoded and dispatched from Bletchley Park to the Submarine Tracking Room in London until 2130, ten hours and one minute later. This delay arose from a lag in the decoding process, a problem encountered by every intercepted and decrypted radio message. For example, at 1116 on 14 December 1942 the BdU ordered fourteen U-boats to establish a patrol line, code-named *Raufbold*, running from approximately 54°N 26°W to 52°N 22°W. This order was not decoded and sent to the Submarine Tracking Room until 1745 on 16 December. But, at 1309 on 15 December, Convoy ON 153 had been intercepted by a U-boat of

[42]PRO, ADM 223/3, 16 Oct. 1942.

the *Raufbold* patrol line.[43] Obviously the text of the decoded message was of academic interest to an intelligence officer, for it did not arrive in the Submarine Tracking Room until long after Convoy ON 153 had been intercepted, too late for the Admiralty to reroute the convoy away from the patrol line. These decoding delays are significant for, while the text of a particular message may be of historical importance, time and time again decryption information arrived in the hands of Allied intelligence officers too late to affect a particular tactical situation in the Battle of the Atlantic.

Throughout the war the Germans used a special grid map to denote and encode the positions of U-boats and other information at sea.[44] For example, at 2000 on 11 April 1943, the U-630 was informed that the 'CONVOY IS SQUARE AK 5873,'[45] 54°09'N 32°35'W. On the German grid map the oceans of the world were arbitrarily divided into zones each assigned a pair of letters, such as AK, BC, CC, etc. Each zone, in turn, was arbitrarily divided into squares assigned two digit numbers, and these squares were broken down into nine smaller squares, numbered 1 through 9, each of which was further subdivided into still smaller squares numbered 1 through 9. Thus the U-630's convoy is located in zone AK and square number 5873 (see map, opposite).

The Allies mastered the system of German grids by reconstructing the map from reading decrypts and by capturing portions of the map. Beginning on 16 June 1941 the BdU, for security reasons, began to super-encode positions which were in the text of some of the coded orders to U-boats,[46] that is, they encoded data that was already encoded. At various times the Germans also employed super-encoding to disguise positions within the text of the BdU's coded orders to U-boats. While super-encoding positions in orders to U-boats sometimes slowed the Allied decoding process, it was found that anyone who read enough decrypts could estimate the locations of U-boats. In addition, the Allies successfully decoded a number of systems used for super encoding positions.[47] Still, the problem was not completely solved until June

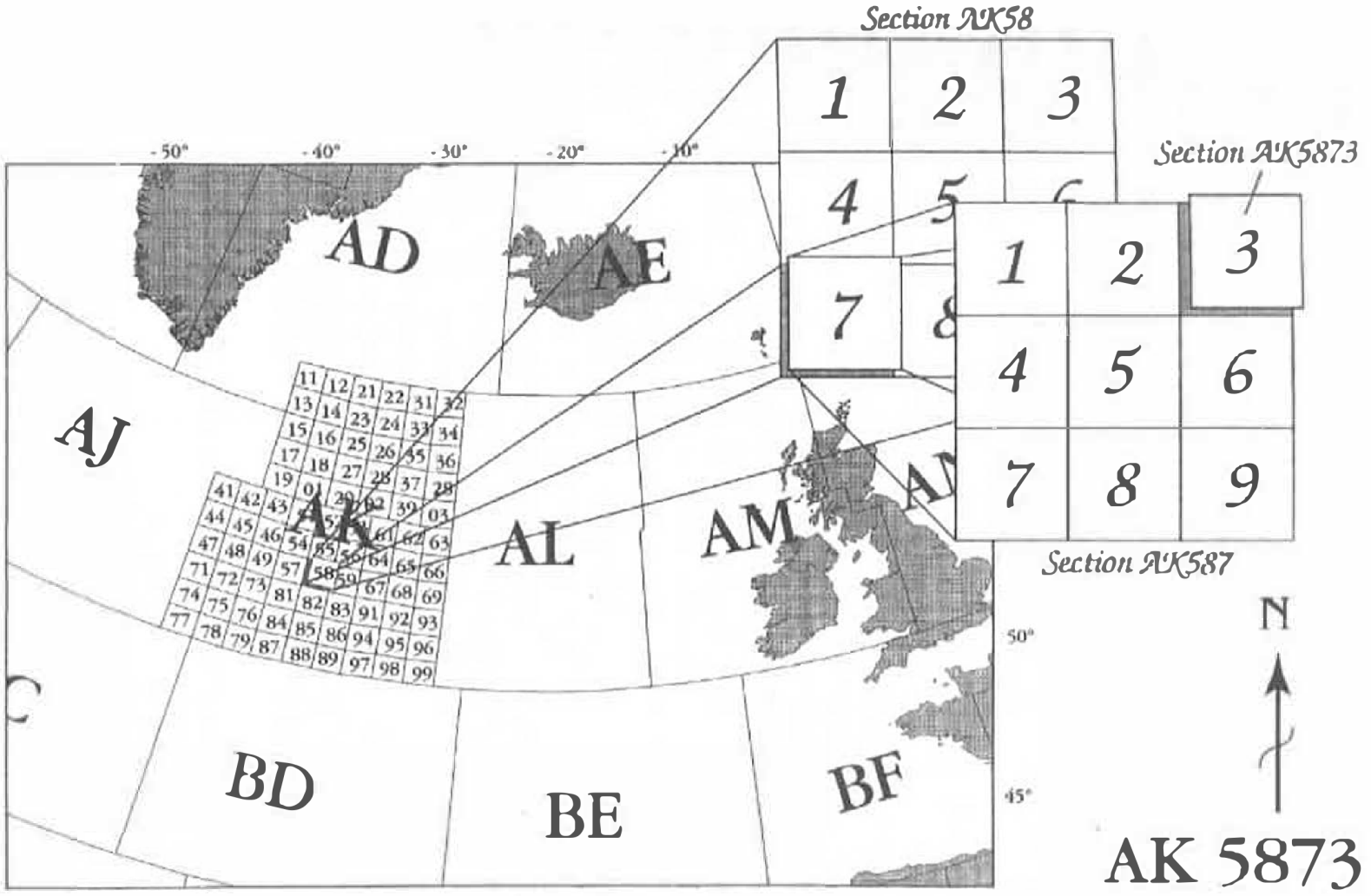
[43]David Syrett, 'The Sinking of HMS *Firedrake* and the Battle for Convoy ON 153', *American Neptune* (Spring, 1991), vol. 51, pp. 105–106.

[44]PRO, ADM 223/3 ff. 259–270.

[45]PRO, DEFE 3/751, intercepted 2000/11/4/43 decoded 0256/12/43.

[46]Hinsley, *British Intelligence*, vol. II, pp. 681–682.

[47]PRO, ADM 223/3, ff. 63–65.



German Navy: Grid Map of North Atlantic

1944, when a copy of the German *adressbuch* was obtained with the capture of the U-505.[48]

Before the Second World War, the US Navy devoted only about 3 per cent of its cryptographic effort to German and Italian codes, but this changed when the United States entered the war.[49] Early in 1942 the British and the Americans agreed to share and coordinate intercept services, D/F and other information from radio-traffic analysis.[50] This agreement was quickly followed by another between the US Navy and the Government Code and Cypher School for decrypting U-boat radio messages encoded in Shark.[51] Throughout the war, the US Army Air Force obtained decryption intelligence from German sources directly from the Government Code and Cypher School at Bletchley Park.[52] No doubt because of its operational commitments to the war against the U-boat and a certain desire to be independent of the British, the US Navy began to decrypt U-boat radio messages encoded in Shark independently of, but in cooperation with, the British in December 1942. When American anti-U-boat operations required information derived from non-Shark German naval codes, the British supplied the data to the US Navy.[53] The US Navy's OP-20Y-G(A)[54] decrypted the U-boat radio messages at the Naval Communications Annex at 3801 Nebraska Avenue in Washington, DC. OP-20Y-G(A) worked closely with the Naval Section of the Government Code and Cypher School at Bletchley Park, exchanging cryptographic information daily by cable.[55]

Decrypts of U-boat radio messages moved from OP-20Y-G(A) by secure teletype or hand-delivery by an officer to F-211 or the Secret Room, the Office of COMINCH on the third floor of Main

[48]Ralph Erskine, 'The German Naval Grid in World War II', *Cryptologia* (Jan., 1992), vol XVI, pp. 39–51.

[49]Kahn, *Seizing the Enigma*, pp. 237.

[50]Hinsley, *British Intelligence*, vol. II, p. 56.

[51]Bradley F. Smith, *The Ultra-Magic Deals; And the Most Secret Special Relationship, 1940–1946* (Novato, Ca., 1993), pp. 124–129.

[52]PRO, 31/20/1–24; James 1. Gilbert and John Finnegan, eds., *U.S. Army Signals Intelligence in World War II: A Documentary History* (Washington, D.C., 993), pp. 136–144.

[53]The British at this time read two other naval codes – Porpoise and Dolphin – in addition to Shark. Hinsley, *British Intelligence*, vol. II, pp. 663-664, 667. Seea also NA, SRMN-051A, OP-20-GI Memoranda to COMINCH F-21 on German U-boat Activities, October 1943-May 1945, f. 144.

[54]Office of Chief of Naval Operations, Communications Division, Communications Intelligence, Cryptoanalysts, Atlantic Theatre.

[55]Kahn, *Seizing the Enigma*, pp. 238–239; Hinsley, *British Intelligence*, vol. II, p. 59.a

Navy near the Washington Mall.[56] In the Secret Room, a staff of four directed by Commander Kenneth A. Knowles, USN, married decrypts of U-boat radio messages to other intelligence, like D/F fixes, ship and aircraft sightings of U-boats and prisoner-of-war interrogations to produce a total intelligence picture. The results, with their sources hidden, then moved out of the Secret Room to F-21's Submarine Tracking Room, the Convoy and Routing Section of the 10th Fleet, and to various combat commands.[57] The Secret Room was in daily teletype contact with the Operational Intelligence Centre's Submarine Tracking Room in London,[58] and the Canadian Submarine Tracking Room in Ottawa.[59]

The format and contents of the decrypts of U-boat radio messages produced by OP-20Y-G(A) were essentially the same as those from the Government Code and Cypher School, with three major exceptions. American decrypts included the numbers of the U-boats as well as the commanders' names. Unlike the British decrypters, the Americans rendered the German grid map reference and super encoding of positions into longitude and latitude. (It should be noted that these positions were not always accurate and were at times approximations.) Finally, the American decrypts sometimes carried notations of the D/F fixes of the transmission.[60] The U-boat numbers, longitudes and latitudes and the D/F fixes all make the American decrypts easier for the historian to use, but the American decrypts deal only with U-boat operations in the Atlantic and cover the period from December 1942 until the end of the war in the Atlantic. Finally, there is a gap in the collection of American decrypts from 28 January to 16 May 1944.

Decrypted radio messages gave the Allies information on many

[56]The American decrypts are located at NA, SRGN-001/49668, German Navy/U-Boat Message Translations.n

[57]Kahn, *Seizing the Enigma*, pp. 237–244; NA, SRMN-038, Functions of the 'Secret Room' (F-211) of COMINCH Combat Intelligence Atlantic Section Anti Submarine Warfare, WW II (undated).

[58]NA, SRNM-35, Admiralty-COMINCH Ultra Message Exchange 25 June 1942–17 Oct. 1944; SRH-208, United States Navy Submarine Warfare Message Reports: COMINCH to Admiralty 3 June 1943–9 June 1945; SRH-236, United States Navy, Submarine Warfare Message Reports: Admiralty to COMINCH, pts. I-X, Serials 001–1678.n

[59]The Canadian Submarine Tracking Room supplied intelligence to the Northwest Atlantic Theatre of Operations and exchanged D/F fixes and other radio-traffic analysis information with both the Submarine Tracking Room in London and F-211 in Washington, DC. Wark, 'Evolution of Military Intelligence in Canada,' pp. 84–85; Beesly, *Very Special Intelligence*, p. 169.

[60]E.g., NA, SRGN-001/49668, German Navy/U-Boat message translations, f. 27063.

different aspects of the U-boat war. For example, Allied intelligence used information from decrypts to calculate the amount of experience of an average U-boat commander on 1 November 1943 as 8.7 months and by 2 March 1944 as only 7.5 months.[61] Decrypts also provided information on the passages through German minefields[62] as well as the rates of fuel consumption by U-boats on operations.[63] The Allies were sometimes even able to obtain specific information such as the Germans' intention to close the U-boat base at Hammerfest, Norway, on 28 November 1944[64] and the German Naval Staff's estimation that 'THE RECC VALUE OF THE U-BOAT IS GETTING LESS AND LESS.'[65] From decrypts and other forms of communications intelligence the Allies gained knowledge of the German high-frequency radio traffic, the radio beacons employed by the German Navy, German methods of radio-traffic analysis, the organization of German naval radio communications in southeast Europe and the Mediterranean, and U-boat short signals.[66]

One of the Allies' greatest achievements came when decrypts revealed that the Germans themselves were reading an Allied code – Combined Cypher 3 – thereby gaining intelligence on the movements of Allied convoys in the North Atlantic.[67] As a result, the Allies phased out Combined Cypher 3, cutting off the U-boats from a major source of intelligence on the movements of Allied convoys.[68] This was a major defeat for the Germans. After the war the US Navy estimated that 70 per cent of the convoys intercepted by the Germans in the North Atlantic between 1 December 1942 and 31 May 1943 were located by information obtained from radio messages encoded in Combined Cypher 3.[69] Until the end of the war, Allied intelligence continued to use decrypted German U-

[61]PRO, ADM 223/18, ff. 42–43; ADM 223/19, ff. 25–28.

[62]PRO, ADM 223/16, ff. 140–142; ADM 223/3, ff. 15–34.

[63]PRO, ADM 223/16, ff. 132–135.

[64]PRO, DEFE 3/473, intercepted 0316/26/10/44 decoded 1532/26/10/44.

[65]PRO, DEFE 3/473, intercepted 1511/27/10/44 decoded 1310/28/10/44.

[66]PRO, ADM 223/3, ff. 66–68, 90–94, 313–315, 346–347; ADM 223/4325 March 1943; ADM 223/4, 17 May 1943; ADM 223/5, 26 Oct. 1943, 11 Sept. 1944; ADM 223/3 ff. 145–151, 250–255, ADM 223/3, ff. 307–308, 331–334, 509–524.

[67]Syrett, *Defeat of the U-Boats*, pp. 135–136, 147–148.

[68]NA, SRMN-054, OP-20-GI Special Studies relating to U-boats Activities, 1943–1945, ff. 148–156; SRH-009, Battle of the Atlantic, vol. I, Allied Communications Intelligence, p. 88.

[69]NA, SRH-367, Battle of the Atlantic, A Preliminary Analysis of the Role of Decryption Intelligence . . .

boat radio messages to assess the German knowledge of Allied codes and ship movements.[70]

Decrypted U-boat radio messages, however, told the Allies almost nothing about the development of new weapons and technology. For obvious reasons, the Germans did not transmit radio messages to U-boats discussing such matters. The best source of information on German naval-weapons development came from decoding and reading the dispatches sent to Tokyo by the Japanese naval attaché in Berlin.[71] This was true in the case of the development of new torpedoes, the schnorchel and new submarines like the Walter boat.[72] However, the Allies first became aware of German development devices such as radar decoy balloons, quadruple 20mm. anti-aircraft guns for U-boats, and submarine bubble targets through prisoner-of-war interrogations.[73]

It was not the development of new technology but its *deployment* that decryption of U-boat radio messages disclosed to the Allies. For example, the Allies learned on 25 November 1944 from a decrypt of a radio message from the 8th U-boat Flotilla that the U-745 was to be fitted with a schnorchel.[74] And a decrypted message transmitted by the BdU on 1 December 1944 revealed that a gnat acoustic torpedo, contrary to the weapon's firing instructions, could actually be fired at any depth of water greater than thirty-five metres.[75]

Information from decrypting radio messages and other communications intelligence gave the Allies a picture of the U-boats' overall deployment and order of battle. By culling through decrypts and other information, extracting a detail here and a fact there, Allied intelligence officers pieced together these naval strategic blueprints. For instance, on 31 October 1944 the Allies learned that the U-1016 was to begin 'SINGLE-SHIP TRAINING' at 0700;[76] that the U-35 was to begin 'FLAK TRAINING' at Swinemunde at 1200 on 5 November 1944;[77] that

[70]NA, SRMN-054, OP-20-GI Special Studies . . ., ff. 258–317.

[71]NA, SRH-025, Battle of the Atlantic., vol. IV, Technical Intelligence from Allied C.I.

[72]NA, SRMN-054, OP-20-GI Special Studies . . ., ff. 407–414, 421–429, 443–450.

[73]NA, SRNM-032, Memoranda Concerning U-boat Tracking Room Operations, 2 January 1943–6 June 1945, f. 096.

[74]PRO, DEFE 3/476, intercepted 0226/25/10/44 decoded 2155/4/12/44. See also PRO, ADM 223/172, Notes on U-boats fitted with SNOT (11.8.44).

[75]PRO, DEFE 3/738, intercepted 1642/1/12/44 decoded 1333/2/12/44.

[76]PRO, DEFE 3/474, intercepted 2110/30/10/44 decoded 1051/1/11/44.

[77]PRO, DEFE 3/476, intercepted 2114/4/11/44 decoded 1302/6/11/44.

the U-1001 was to enter the dockyard at Danzig for a 'LONG PERIOD' on 1 November 1944;[78] and that the U-2321, U-2355, U-2326 and U-2328 would complete their 'FIRING AND HARBOUR TRAINING on 23 November 1944.'[79] By collecting and analysing such information, the Allies could figure out such things as the 'State of the U-boat Fleet on 1st October 1942'[80] or the average number of U-boats newly working up in the Baltic.[81] They also deduced that in 1942 U-boats departed from the Baltic for service in the Atlantic at the rate of 17.3 per month;[82] that the average length of time spent at sea by a U-boat in 1943 was fifty days and that at any given time in late 1943 and early 1944, 41 per cent of all operational U-boats were at sea.[83] In the last three years of the war, F-211 of the US Navy compiled an impressive file listing on a day-by-day basis the known and estimated positions and activities of every U-boat known to be at sea.[84]

Above all, the timely decryption of U-boat radio messages gave the Allies detailed information on impending German operations. Very rarely did a U-boat go to sea with complete operational orders. It was the BdU's standard operating procedure for the BdU to send a U-Boat radio operational orders and instructions only after the submarine was at sea.[85] For example, on 19 May 1943 twenty-two U-boats were ordered to establish a patrol line at 2000 on 21 May 1943, running from 55°15'N 44°25'W to 52°09'N 37°15'W. This message was decoded at 1443 on 23 May,[86] giving the Allies exact foreknowledge of the patrol line's establishment some thirty hours before it would take effect. Obviously the value of timely intelligence of this type was priceless.

One of the most important uses made of communications intelligence in the Battle of the Atlantic was to avoid battle with the U-boats. During the Battle of the Atlantic the Allies employed a strategy of convoy, and the success of this strategy is measured not by battles won or enemy vessels sunk but by merchant ships'

[78]PRO, DEFE 3/477, intercepted 0316/4/11/44 decoded 0558/7/11/44.
[79]PRO, DEFE 3/484, intercepted 2131/23/11/44 decoded 1318/26/11/44.
[80]PRO, ADM 223/3 ff. 480–482.
[81]PRO, ADM 223/16, f. 141.
[82]PRO, ADM 223/16, ff. 142.
[83]PRO, ADM 223/19, f. 47.
[84]NA, SRMN-034, COMINCH: Rough Notes on Daily U-boat Positions and Activities, 1943–1945.
[85]NA, SRMN-032, Memoranda Concerning U-boat Tracking Room Operations, 2 January 1943–6 June 1945, f. 099.
[86]NA, SRGN-001/49668, German Navy/U-Boat Message Translations, f. 18514.

safe and timely arrival at their destinations.[87] During 1941, when the British were able to read coded German naval radio messages this policy was successful.[88] Moreover, the high speeds of the troop convoys and large troop-carrying liners, such as the *Queen Elizabeth*, enabled them be successfully routed around the U-boats.[89] However, even when the 'Great Blackout' ended and the Allies began to read Shark in December 1942, the policy of avoiding battle with slow convoys of merchant ships became nearly impossible. On 17 May 1943, it was estimated by the Admiralty Submarine Tracking Room that 120 U-boats operated in the Atlantic, of which 'about 90 of these are in the area North of 45°00'N.'[90] This was just too many U-boats to be avoided totally by all the slow convoys. The situation was aggravated further because the Germans had cracked Combined Cypher 3, which gave them foreknowledge of the transatlantic convoys' routes.[91]

If an Allied convoy could not avoid the U-boats then the timely decoding of U-boat radio messages could alert the convoy of the presence of the U-boats. This gave rise to cryptic and oracle-like warnings from the Admiralty and COMINCH to convoys such as the one received by the commander of the escort of Convoy ONS 5 concerning an impending German attack: 'At 1530B, received Admiralty's 241114B, stating that the convoy had been reported.'[92] However, more important than such warnings was the ability to dispatch groups of escorts known as support groups to reinforce a convoy threatened with attack. Thus when communications intelligence signalled an impending U-boat attack in May of 1943, the escort of Convoy SC 130 was reinforced by four warships of the 1st Support Group.[93] However, once a convoy had been intercepted by U-boats, the decryption of enemy radio messages and D/F fixes obtained by shore-based intercept stations usually did not provide

[87]Cf. Admiralty Historical Section, *The Defeat of the Enemy Attack on Shipping, 1939–1945* (London, 1957). [Reprinted as: E.J. Grove, ed., *The Defeat of the Enemy Attack on Shipping 1939–1945* (Aldershot: Ashgate for the Navy Records Society, 1997)].

[88]Rohwer, 'The Wireless War', p. 411.

[89]Beesly, *Very Special Intelligence*, pp. 147–148.

[90]Document No. 113.

[91]NA, SRH-367, Battle of the Atlantic, A Preliminary Analysis of the Role of Decryption Intelligence . . .

[92]PRO, ADM 237/113, CONVOY ONS5. REPORT OF PROCEEDINGS – SENIOR OFFICER H.M.S. DUNCAN.

[93]David Syrett, 'The Safe and Timely Arrival of Convoy SC 130, 15–25 May 1943', *American Neptune* (Summer, 1990), vol. 50, p. 220.

information that affected the ensuing battle between escorts and the U-boats.

After the Germans ended wolf-pack attacks on convoys in 1943, they continued to fight what amounted to a maritime guerrilla war. Once again communications intelligence played a vital role as the Allies searched for individual U-boats. Such information allowed the Allies to approximate the location of a U-boat and then to send ships and aircraft to hunt down and sink the enemy vessel. For example, at the beginning of 1945 four American destroyer escorts using communications intelligence located and then destroyed the U-248. This enemy vessel was a weather-reporting U-boat whose duties demanded that she maintain station and make regular radio transmissions.[94]

However, during the last years of the war most U-boats did not remain in the same area for extended periods of time and maintained radio silence as much as possible. Indeed, some U-boats went 'as long as 30 or 40 days without making a single radio transmission.' The only way that the Allied intelligence authorities could locate a U-boat that maintained radio silence for a long time was by dead reckoning. Even though dead reckoning, according to US Navy intelligence, was not 'as unsatisfactory' as it might appear at first sight, it was still a rough and ready method to find a U-boat's position.[95] Uncertainties such as the weather and the condition of a U-boat's machinery might throw off the dead-reckoning position, and mistakes in successive dead-reckoning positions are cumulative and compound with each recalculation of the position.[96]

One historian has concluded that a U-boat whose position was estimated by dead reckoning could be anywhere in an area of between '10,000 to 15,000 square miles.'[97] Nevertheless, it was found that the combination of communications intelligence and dead reckoning, however imperfect, could locate a U-boat closely enough to give aircraft a fairly good chance of locating and attacking the enemy vessel. Because they could search large areas of the sea, aircraft enabled the Allies to hunt down a number of

[94]David Syrett, 'Weather-Reporting U-boats in the Atlantic, 1944–45: The Hunt for the U-248', *American Neptune* (Winter, 1992), vol. 52, pp. 16–24.

[95]NA, SRMN-051A, OP-20-GI Memoranda to COMINCH . . ., f. 148; SRMN-037, COMINCH File: U-Boat Intelligence Summaries, January 1943–May 1945.

[96]Cf. Document No. 272.

[97]Roger Sarty, 'The R.C.A.F., "Ultra" and the Anti-Submarine Campaign in the North-West Atlantic, 1943–1945', unpublished paper given at the 1992 meeting of the North American Society for Oceanic History.

U-boats in 1943–1945. For example, aircraft and warships of the US Navy employed a combination of communications intelligence and deed reckoning to sink the U-1062 in the central Atlantic.[98] The success of the US Navy hunter-killer groups, built around escort aircraft carriers, depended on communications intelligence and the ability of aircraft to conduct searches over great areas of the ocean.[99]

U-Boat Situations and U-Boat Trends

The documents printed in this volume – *U-Boat Situations and U-Boat Trends* – were based primarily on decryption intelligence and were distributed by the Admiralty's Operational Intelligence Centre to inform a small number of the highest officials and commanders of the Royal Navy of the current state and progress of the war against the U-boats.[100] The weekly *U-Boat Situation* series showed the worldwide deployment of German U-boats and gave a general account of their activities and those of the Allied anti-U-boat forces. The *U-Boat Trends* bulletins, on the other hand, were designed to keep readers abreast of the latest technological developments and strategic and tactical trends in the war against the U-boats and were issued on an irregular basis as the situation demanded. The first *U-Boat Situation* appeared on 15 December 1941[101]. From 5 January 1942 until war's end,[102] it appeared on a weekly basis. *U-Boat Trends* began their publication on 2 November 1942,[103] with special supplements when events warranted.[104] Apparently a number of *U-Boat Trends* did not make

[98]David Syrett, 'Communications Intelligence and the Sinking of the U-1062: 30 September 1944', *The Journal of Military History* (Oct. 1994), vol. 58, pp. 685–698.

[99]Cf. NA, SRH-008, Battle of the Atlantic: vol. II, U-boat Operations.

[100]On 29 January 1945 the *U-Boat Situation* [Document No. 299] distribution list was: First Sea Lord, Assistant Chief of the Naval Staff (Home), Assistant Chief of the Naval Staff (Foreign), Assistant Chief of the Naval Staff (U-Boats and Trade), Director of Plans, Director of Operations (Home), Director of Operations (Foreign), Commander-in-Chief, Rosyth, Commander-in-Chief, Plymouth, Commander-in-Chief, Home Fleet, Commander-in-Chief, Western Approaches, Air Officer in Command, Coastal Command. On 28 February 1945 the *U-Boat Trend* [Document No. 308] distribution list was: First Lord of the Admiralty, First Seat Lord, Vice Chief of the Naval Staff, Assistant Chief of the Naval Staff (Home),t Assistant Chief of the Naval Staff (Foreign), Assistant Chief of the Naval Stafft (U-Boats and Trade), Director of the Anti-U-Boat Division, and Director of Plans.t

[101]Document No. 1.

[102]Document No. 5.

[103]Document No. 47.

[104]E.g. Document No. 69.

their way to the Public Record Office, for the official collection of these documents is incomplete.

The authors of the *U-Boat Situations* and *U-Boat Trends* were Rear Admiral J.W. Clayton, RN, head of the Operational Intelligence Centre, and Commander Rodger Winn, RNVR, head of the Submarine Tracking Room. At first Clayton was responsible for writing both *U-Boat Situations* and *U-Boat Trends*, but on 8 August 1943[105] Winn took over the task of compiling *U-Boat Situations* while Clayton continued with *U-Boat Trends*.

An officer in the Royal Navy and a specialist in navigation, Clayton was educated at HMS *Britannia*, served in the Gallipoli campaign and was a watchkeeper in Room 40 during the First World War. After the war Clayton commanded the cruiser HMS *Emerald* and the aircraft carrier HMS *Furious* before being placed on the retired list, where he rose to the rank of rear admiral in 1940. Before the beginning of the Second World War, Rear Admiral John Godfrey, the director of Naval Intelligence, appointed Clayton from retirement to be the head of the Operational Intelligence Centre with the grade of Deputy Director Intelligence Centre within the Royal Navy's Naval Intelligence Division. In Godfrey's words, Clayton was 'a man of unruffled calmness, impossible to rattle and with very shrewd judgement.'

Unlike Clayton, Rodger Winn was not a regular navy officer but a barrister educated at Trinity College, Cambridge, and in the United States. Appointed as a civilian to the staff of the Submarine Tracking Room in the Operational Intelligence Centre in 1939, Winn quickly showed great ability as an intelligence officer and was commissioned a commander in the Royal Naval Volunteer Reserve and appointed head of the Submarine Tracking Room the following year. According to one of his colleagues at the Operational Intelligence Centre, Winn was 'ideally suited to the job' of heading the Submarine Tracking Room. In 1944, on the recommendation of the Assistant Chief of Staff (U-Boats and Trade) and several other high officials in the Admiralty, Winn was promoted to the rank of captain in the Royal Naval Volunteer Reserve in recognition of his 'brilliant service' in the Submarine Tracking Room.[106]

The *U-Boat Situations* and *U-Boat Trends*, based on decryption

[105]Document No. 144.

[106]*Who was Who, 1951–1960* (London, 1961), p. 216; *Who was Who, 1971–1980* (London, 1981), p. 872; Beesly, *Very Special Intelligence*, pp. 19–21, 58, 236.

and other intelligence, and written by two men who were at the centre of the Allied intelligence effort against the German U-boats, are of pivotal importance to understanding the Battle of the Atlantic. These documents not only provide an 'insider's' history of the conflict, but they also show with exceptional clarity what the Allies knew at any given time about the activities of the U-boats.

One of the greatest problems confronting naval historians of the Second World War is their inability to know what weight decryption and other intelligence materials played in the decision-making process within various Allied command authorities. A scholar can tell what information in the form of decrypts went into the Submarine Tracking Room and the Secret Room. *U-Boat Situations*, *U-Boat Trends*, and other documents record what intelligence was sent to the command authorities in the Admiralty and various commanders who drew up the operational orders and instructions for the various combat commands of the Royal Navy. But it is sometimes nearly impossible to determine what part, if any, intelligence in general or particular types of information such as decrypted U-boat radio messages played in drawing up the orders issued to various combat commands.[107]

This arises from the nature of the Allied command structure and intelligence activities. Intelligence officers operate in secret and like to keep their activities secret even after the event. Documents such as the war diary and other papers of the Operational Intelligence Centre were destroyed 'in the interests of security' once peace came,[108] and there is reason to believe that a number of documents from the Secret Room were also destroyed at the end of the war.[109] Further, it appears that the British Ministry of Defence[110] and the American National Security Agency in the United States have not declassified a number of documents pertaining to the Battle of the Atlantic.

Thus historians have to confront not only the problem of missing evidence but also the difficulties created by the way in which decryption intelligence was handled after it left the hands

[107]For a discussion of a willingness to disregard decryption intelligence in a different theatre of the Second World War, see Edward J. Drea, *MacArthur's Ultra: Code Breaking and the War against Japan, 1942–1945* (Lawrence, Kans., 1992), pp. 226–235.

[108]Beesly, *Very Special Intelligence*, pp. 261–262.

[109]NA, SRMN-032, Memoranda Concerning U-boat Tracking Room operations, 2 January 1943–6 June 1945, f. 263.

[110]E.g. ADM 223/97, 100, 101.

of intelligence officers. For reasons of security very few people in the Allied command structure received or even had knowledge of U-boat decryption intelligence. Only a handful of officers in the Royal and US Navies knew that U-boat radio messages were being decoded and made decisions based on this information. In Washington, DC Commander Kenneth A. Knowles, USN, commander of the Secret Room, operated under conditions of extreme secrecy, with 'perhaps half-a-dozen senior officers' of the US Navy aware of the existence of U-boat decryption intelligence.[111] In the Admiralty, apart from the Operational Intelligence Centre, the First Lord, First Sea Lord and perhaps five or six others received decryption intelligence. And at Western Approaches Command and RAF Coastal Command, only the commanders-in-chief and three staff officers at each headquarters were aware of the existence of U-boat decryption intelligence.[112]

In addition, in most cases there is no evidence of the passage of decryption information from intelligence officers to the command authorities, for this was usually an oral process that left no written records of the transaction. For example, the Submarine Tracking Room at the Admiralty was in direct daily telephone contact with Headquarters, Western Approaches Command and Headquarters, RAF Coastal Command.[113] Another complication is that the commanders and staff officer authorized to receive decryption intelligence were under orders to conceal the information's true source and to ensure that no decision or order reflected the fact that it was based on decryption of enemy radio messages.[114] At the Admiralty, information obtained from decryption of enemy radio messages was reflected in a special chart that could be seen only by people cleared for Ultra knowledge. Personnel without such clearance were ignorant of the existence of that chart and saw, instead, the 'main plot' which showed the status of the Battle of the Atlantic based on non-Ultra data. Information such as the position of a U-boat that came from Ultra could be moved to the main plot only when non-Ultra sources for the information could be provided.[115] And as Patrick Beesly points out,

[111]NA, SRMN-032, Memoranda Concerning U-boat Tracking Room operations, 2 January 1943–6 June 1945, f. 183; Knowles, 'Ultra and the Battle of the Atlantic: the American View', p. 445.

[112]Beesly, *Very Special Intelligence*, pp. 99–100.

[113]Beesly, op. cit., pp. 99–100, 167–168.

[114]Knowles, 'Ultra and the Battle of the Atlantic: the American View,' pp. 445–446. See also Winterbotham, *The Ultra Secret*, pp. 14–24.

[115]PRO, ADM 223/92, f. 6.

> one side-effect of these arrangements was that the great majority of important operational decisions were not taken in the main Operational Rooms in the Admiralty and other commands, whose plots could not show enemy dispositions in detail. They were taken instead in Rooms of the O.I.C. [Operational Intelligence Centre], or in small side offices at Western Approaches and Coastal Commands.[116]

Thus the historian who tries to identify the 'why', 'how', and 'who' that went into an Allied command decision in the Battle of the Atlantic has to have information for which there is almost no existing record. And in many cases the existing written record may be misleading.

These circumstances conspire to make it difficult to reconstruct Allied decision-making during the Battle of the Atlantic. Still, it is incontrovertible that communications intelligence gave the Allies a huge advantage over the U-boats in the Battle of the Atlantic. The timely decryption of U-boat radio messages gave the Allies foreknowledge of German intentions and permitted routing convoys away from the U-boats and provided the information required to fight and win the battles with the wolf packs. After the great convoy battles of 1943, communications intelligence also allowed the Allies to hunt down and sink individual U-boats in the vastness of the Atlantic. Furthermore, information from communications intelligence – decryption and radio-traffic analysis – gave the Allies insights into such areas as U-boat standard operating and communications procedures, the location of German minefields, U-boat orders of battle and German knowledge of Allied codes. Probably never before did one side in a battle know so much about the other side as the Allies did about the Germans in the Battle of the Atlantic. Still, communications intelligence did not make German U-boat operations an open book to the Allies. In the first years of the war, the Allies could not read coded German U-boat radio messages and throughout the Germans prudently excluded certain types of information from radio transmissions to U-boats. And the best intelligence could not overcome Allied shortcomings in materiel, organization or strategy. Even when the Allies had mastered the German codes, there were many occasions when delays or lags in the decoding process made decrypted information of little more

[116]Beesly, *Very Special Intelligence*, pp. 100–101.

than academic interest. Communications intelligence did not win the Battle of the Atlantic by itself, but it greatly increased the effectiveness of Allied naval and air forces, shortening the conflict by months, if not years.

With all of these reservations, communications intelligence, especially information from decryption, adds a whole new dimension to the history of the Battle of the Atlantic and the whole of the war. The *U-Boat Situations* and *U-Boat Trends* printed in this volume are merely a generous sample of decrypts and other documents in the Public Record Office and National Archives that can afford truly rich insights into the conduct of the conflict.