

Confronting Technological and Tactical Change

Allied Anti-Submarine Warfare in the Last Year of the Battle of the Atlantic

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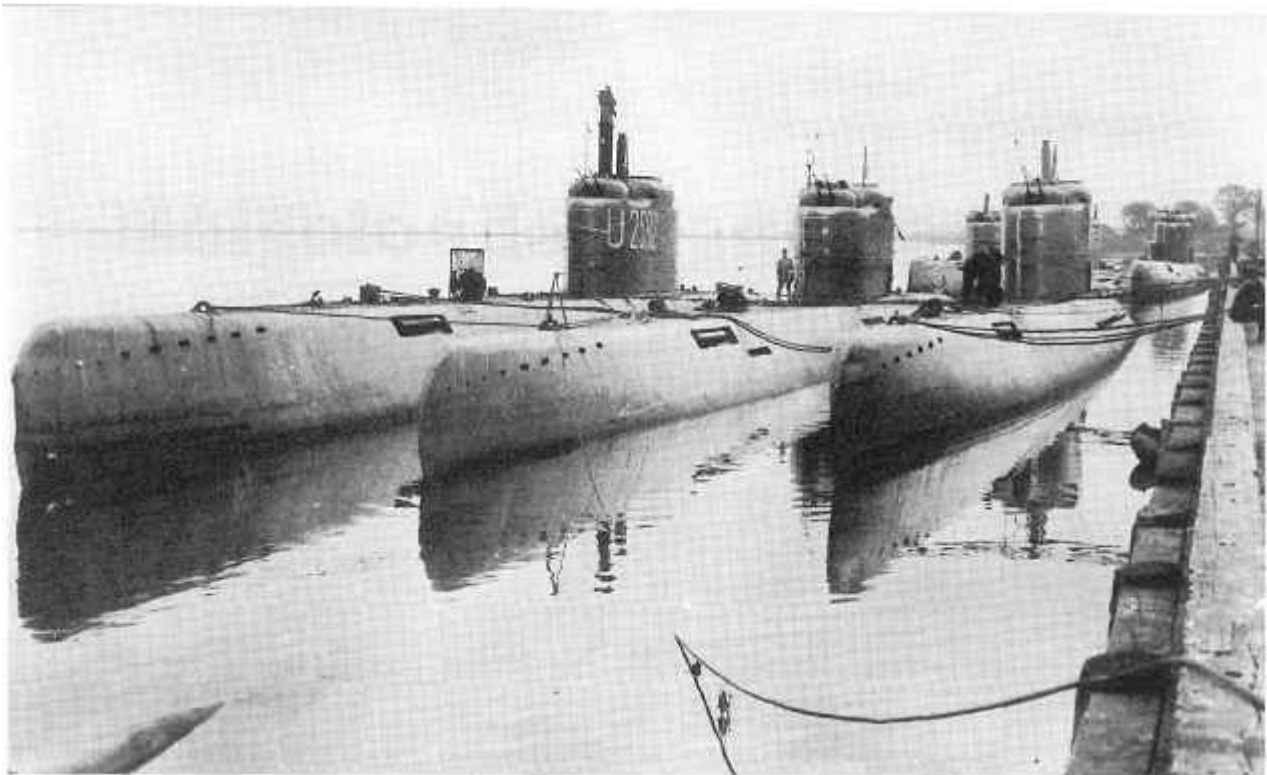
The recall of German U-boat wolfpacks from the central north Atlantic at the end of May 1943 ended the most costly phase of the shipping war for the Allies. Never again would the German U-boats inflict dangerously high shipping losses.¹ The naval war remained bitter, nonetheless, for the U-boats refused to give up, turning instead to new technology and new tactics. Right to the end, they continued to present a plausible threat that caused concern in high Allied circles. Indeed, in January 1945 the First Sea Lord of the Admiralty was moved to warn that, "The high shipping losses which may occur during the first half of 1945 may well prejudice the maintenance of our forces in Europe...."²

The ensuing struggle in early 1945 led to a confrontation between improvised technological improvements and tactical changes by the U-boats countered by operational and tactical adaptation produced in reply by Allied anti-submarine warfare (ASW) forces. This last phase of the battle of the Atlantic was fought out for the most part in the confusing and difficult shallow waters around the coasts of the United Kingdom and off the east coast of Canada, moving to the shores of the United States only in the last few months of the war. This campaign provides insights into how new and unexpected initiatives by an enemy could be dealt with even when no technological solutions were readily at hand. It also illustrates the difficulty that both submarine and antisubmarine forces encounter when operating in the challenging environment of shallow water.³

Improvements in Submarine Technology

Somewhat paradoxically, the new challenges to Allied ASW forces in 1944-45 were born of their very success in the Spring of 1943. In desperation, the Germans adopted new tactics. These featured submerged penetration of focal areas of trade by individual boats, which then waited for targets of opportunity, made sudden ambushes, and then immediately executed extreme evasive manoeuvres for prolonged periods. Unlike the massed "wolfpack" attacks against convoys which had been the hallmark of U-boat operations in 1942-1943, these so-called "static"⁴ tactics seldom caused severe losses because U-boats spent far more time avoiding detection than aggressively seeking opportunities to attack. Yet their new success in avoiding detection in areas where the Allies had previously been able to detect and destroy them caused concern in some quarters of the Allied High Command.⁵ As 1944 drew to a close this apprehension grew because it appeared that the U-boats were not only mastering the art of evading antisubmarine forces but were once more becoming effective in their attacks.⁶

The new equipment which allowed this dramatic change in U-boat tactics was the schnorkel.⁷ This was a comparatively simple device which provided enough air to allow U-boats to operate their diesel engines while submerged.⁸ Little more than a tube about as



Sleek type XXI U-boats at Lisahally, Northern Ireland, 1945. U-2582, on the left, has her schnorkel mast raised. The submarine in the middle is U-2511, the only type XXI to undertake a wartime cruise.

long as the submarine's periscope, the schnorkel greatly reduced a U-boat's vulnerability to searching Allied forces because its small head was far less conspicuous than the submarine's conning tower. Moreover, travelling slowly and carefully, the U-boat needed to use the schnorkel only three to five hours in every twenty-four.⁹ Most U-boat commanders prudently schnorkeled at night to avoid visual detection of the smoke produced by the submarine's diesel engine. In addition, the head of most schnorkels was fitted with a detection device that gave warning of the approach of Allied radars.¹⁰ Since the U-boat was already submerged when using its schnorkel, an alert crew could usually dive deep and escape before an attack could be launched even if an Allied radar operator could distinguish the small echo of the tube from the random returns provided by ocean swells or flotsam and jetsam.

Schnorkel-equipped U-boats were sent into the English Channel during the summer of 1944 to attack the heavy flow of shipping that sustained the Normandy beachhead; their commanders learned that they could operate in the most heavily defended waters.¹¹ The Allies had anticipated an aggressive response to the June 1944 invasion and had prepared a comprehensive defence in depth of the Channel. Massed ASW forces devastated U-boats not yet equipped with schnorkels (at the time a majority) but found schnorkel-equipped submarines a

frustratingly difficult opponent.¹² Although shipping losses remained comparatively light, schnorkel-equipped U-boats regularly prowled in the vicinity of the shipping routes to the beachheads. Even when discovered these submarines proved elusive targets, and, in view of the immense concentration of ASW forces, remarkably few were destroyed.¹³

In addition the Allies (thanks to decryption of high-level German message traffic, an intelligence source known as "Ultra") were acutely aware of the possibilities of the new U-boat designs.¹⁴ The Type XXI and Type XXIII boats were the first conventional submarines capable of rapid underwater manoeuvring.¹⁵ Although they could sustain high-speed manoeuvres for perhaps only an hour or an hour and a half, these submarines were the most menacing known at that time.¹⁶ German authorities assigned the highest priority to their production in July 1943, but the first few only became operational as the war ended.¹⁷ The potential impact of these vessels on the trans-Atlantic logistics of the Allied campaign in Europe remains one of the most interesting subjects for speculation. Fortunately for the Allies, however, the war was fought with older, Type VII and Type IX, U-boats re-equipped with schnorkels and radar detectors.

The only area where schnorkel-fitted boats could achieve any success was in the coastal areas near ports and focal points of shipping.¹⁸ Although both Allied and German naval officers considered in late summer 1944 that a return to open-ocean wolfpack operations would be the only way in which Allied shipping could be interdicted effectively, and though such tactics might arguably have been practical using the new submarines,¹⁹ the Germans realized that such tactics were impossible with the older U-boats. The Germans were encouraged by the ability of schnorkel-equipped submarines to operate in such heavily defended waters as the English Channel²⁰, but were acutely aware that simply surviving was not enough. Shipping had to be destroyed if the apparently inexorable Allied advance was to be slowed, and too few ships were being sunk. Still, the schnorkel-equipped boats had just garnered the greatest success that German submarines had enjoyed since the fall of 1943. As the summer of 1944 waned, *Befehlshaber der U-boote* (U-Boat Headquarters, or BdU) decided that until improved types of U-boats became operational, an offensive in coastal areas offered the best chance of inflicting losses on the Allies.²¹

Shallow Water Submarine Warfare

With their decision to move into coastal waters using older schnorkel-equipped U-boats, the Germans created a difficult problem for the Allies. Shallow water ASW had been rare since early in the war. The Germans had found operating in coastal waters without schnorkels prohibitively difficult because of constant Allied air patrols.²² In the first half of the war U-boats endeavoured so consistently to escape to deep water that Allied doctrine prior to the Normandy Invasion presumed that after an attack or upon being detected, U-boats operating in shallow water would head for deep water. The possibility that a U-boat might either settle on the bottom or move closer inshore was "considered unlikely."²³

As it became apparent that the U-boats had begun to do exactly that, the Allies discovered that shallow water ASW was, for many reasons, a particularly demanding art. Sound conditions are extremely changeable in shallow water, a function of tidal and current variations. The effect

of the bottom is another factor which can be largely ignored in deep water, but not along the coast. Rocks and shoals, as well as shipwrecks and schools of fish, produce convincingly submarine-like echoes. Finally, the effect of fresh water from rivers and streams is frequently pronounced, and, in combination with temperature variations, cause especially dense layers to form in the water that so affect the propagation of sound as to effectively "blind" the sonar of a searching warship.

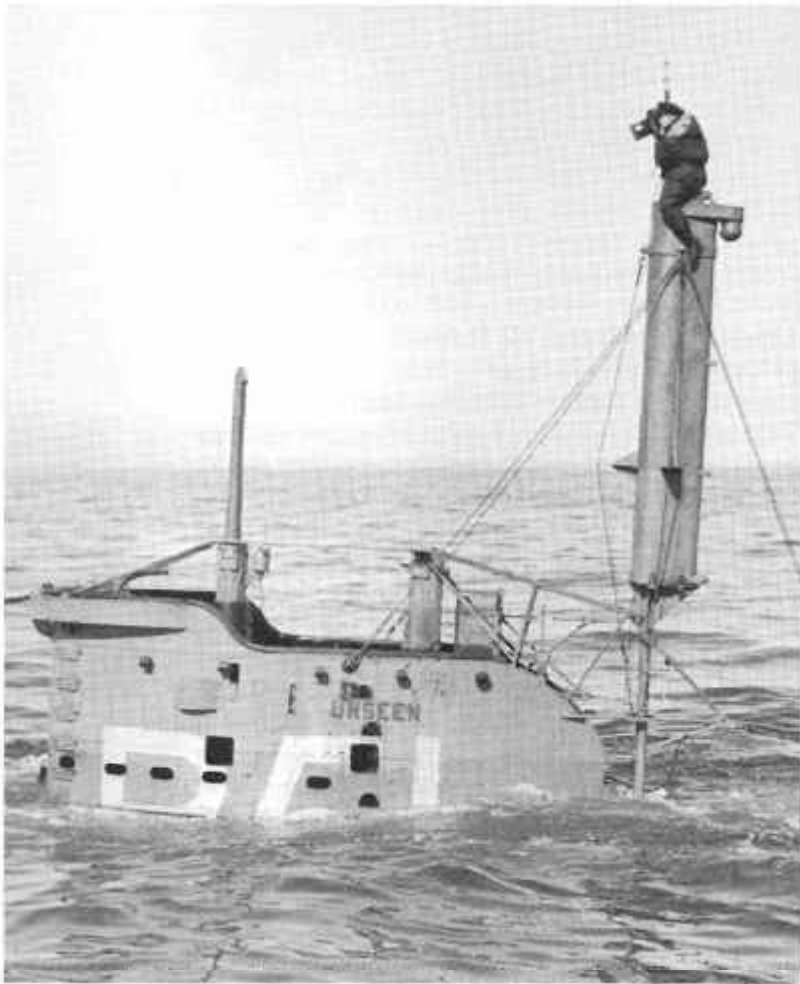
Consequently warships acting as close escort to convoys rarely detected a U-boat in shallow water before the submarine attacked. During this stage of the war U-boats often rested on the bottom in the vicinity of shipping traffic, rising up to fire a torpedo only when alerted by the sound of an approaching convoy. Waiting to detect convoys passively by their noise did not prove adequate, however, and in mid-December 1944 BdU ordered all U-boats to remain at periscope depth during daylight hours so as to increase their chance of finding targets visually.²⁴ This helped the U-boats somewhat, and the U-boat's chance of being detected by the escort before it attacked remained slight. After firing, the submarines usually either made off at slow speed just above the bottom, sometimes simply drifting with the tide, or rested on the bottom until searching forces had moved on.²⁵ Close escort vessels had little chance to destroy a submarine employing such snap attacks and, since they had to remain with their convoy, could rarely stay in the vicinity of an attack long enough to conduct the prolonged and methodical search necessary to find a bottomed or deep, slow-moving U-boat.

Aircraft patrolled coastal waters incessantly but rarely spotted schnorkels, and had great difficulty attacking even if an aircrew was fortunate enough actually to find one.²⁶ New sensors such as sonobuoys were being introduced, but these were in a primitive stage of development. On occasion U-boats were detected by sonobuoys and then attacked by air-dropped homing torpedoes - a very modern tactic indeed - but too rarely to have any significant impact on the campaign.²⁷ The main effect of ASW aircraft was the caution that their pervasive presence induced among most U-boat crews. Seldom daring to surface, U-boats travelled slowly underwater at a fraction of their

surfaced cruising speeds, groping for clues to their actual position.²⁸ Radio communication with BdU, which required the submarines to surface and exposed them to the efficient Allied radio-direction-finding network, became extremely intermittent and contributed to a growing inability at BdU to follow operations at sea.²⁹ Overall, ASW aircraft substantially reduced the effectiveness of U-boats at sea, but did not neutralize them. More direct measures were needed.

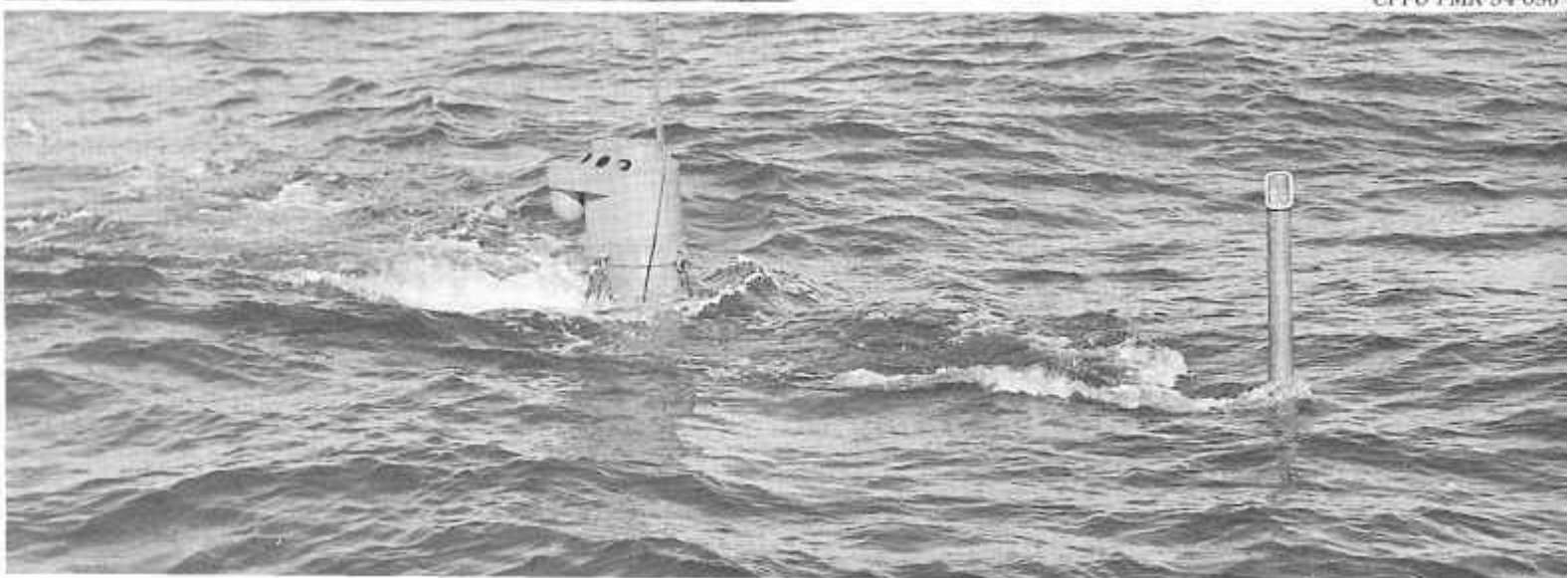
The strategic bombing campaign, for its part, succeeded in stopping U-boat production as the war drew to a close, and mines laid in the Baltic by these aircraft severely hindered the training of new U-boat crews.³⁰ These achievements gave promise of causing the entire German submarine campaign eventually to wither, but there was little that strategic bombers could do to counter the hundreds of U-boats that were already operational.

American hunter-killer groups had proved formidable U-boat killers during 1943 and early 1944, but rarely encountered German submarines in the later part of the war. As a result of rationalization of command structures and operating areas among the Allies in early 1943, the USN handled the central Atlantic and the eastern seaboard of the United States, while British and Canadian forces were primarily responsible for the north Atlantic. Since by mid-1944 few U-boats remained in the central Atlantic, and not many submarines could reach the eastern seaboard when they travelled submerged, USN hunter-killer groups seldom had any opportunity to show their mettle after 1943. When U-boats began to penetrate into US waters in the last few months of the war, the USN demonstrated remarkable adaptability and success in countering them.³¹ The growing strength of the USN as the European war closed did allow that navy to "maintain nearly as many



Left: An unlikely place to find an air force photographer! However, a good shot of the dummy schnorkel mastfitted to the British training submarine HMS Unseen, based at Digby, JNS in early 1945.

Below: A hard target for radar or human eye. The dummy schnorkel and search periscope of HMS Unseen as they appear when the sub is submerged.



ships and aircraft in the Canadian zone [the waters adjacent to Newfoundland and the Canadian coast] as the entire naval and air strength normally available to the commander-in-chief Canadian Northwest Atlantic."³² Nevertheless, it was at this late stage a minor player, because the main battle against schnorkel U-boats was now in the waters around the British Isles, the one area still within reach of most U-boats in the beleaguered German fleet. Almost by default, therefore, the main burden of counter-measures against the coastal campaign by schnorkel-equipped U-boats fell to RN and RCN "support groups."

Support Groups

The ships of these groups were theoretically well-prepared to deal with the new German tactics. They were the best equipped for ASW in their respective navies. By this late stage of the war, the majority were either frigates or an equivalent class of vessels, fitted with the most modern weapons and sensors. The role of support groups was to find and destroy U-boats wherever they operated.

The idea of a group of escorts whose primary role was to counter U-boats was straightforward enough. Experiments as early as 1941 had indicated how effective such an organisation could be.³³ However, it was only when enough ships became available to provide close escorts for all convoys that support groups were finally established in significant numbers. As the battle on the North Atlantic convoy routes approached its peak in the spring of 1943, the formation of five such support groups was one of the major initiatives taken that resulted in the crushing defeat of wolfpack attacks.³⁴

The Royal Navy most commonly used support groups as rapid reinforcements for convoys either under attack or expected to come under attack. This practise was extremely effective as an antidote to wolfpacks, but lost its utility as the Germans changed their tactics. USN Hunter-Killer Groups, the American equivalent of support groups, emphasized the actual hunting of U-boats using radio-intelligence. These USN groups were enormously successful in the summer and fall of 1943. The debate over which approach was more strategically and

tactically sound was a lively one both at the time and since. However, the argument was reduced to irrelevancy in the face of the new German tactics, which largely denied both Anglo-Canadian and American forces the intelligence they required to use these groups in their preferred ways.³⁵

The great strength of support and hunter-killer groups was that because they were not preoccupied with protecting convoys they had great flexibility. This allowed them to adopt procedures which became the foundation of eventual Allied success in the contest with inshore submarines. Prolonged searches for U-boats became a staple in their tactical inventory, as did extended operations in geographical areas where U-boat activity was high.

During 1944 the number of support groups in the North Atlantic grew to 17 RN and 7 RCN.³⁶ The predominance of the Royal Navy in support groups was partly a result of its larger size, but it also reflected the greater role the Royal Canadian Navy continued to play in the close escort of north Atlantic convoys. The reason for this inequitable distribution is not clear in the records, but it is not unlikely that the RN considered close escort a less demanding task than operating as a support group, and therefore more suited to the RCN's capabilities.

Most support groups were allocated to United Kingdom waters, which senior Canadian and British officers appreciated was the critical area. This left the Canadian coast inadequately protected, but despite the risk the Canadian Naval Staff recommended that the five RCN support groups under the operational control of the RN remain in UK waters "unless there is a real need for them."³⁷ In other words, unless intelligence provided clear indication that a large number of U-boats were en route to Canada or shipping losses soared.

Despite the advantage of vastly superior numbers, adequate time to search and good equipment, support groups found the task of locating schnorkel-equipped U-boats in coastal waters extremely challenging. The first experience these ships had with the new German tactics was in the difficult shallow waters of the English Channel in the wake of the Normandy invasion. One particularly graphic account is

provided by Allan Easton, who commanded the destroyer HMCS *Saskatchewan* at the time. On 7 June 1944, his ship was narrowly missed by two German torpedoes, one of which apparently exploded prematurely, the other being detonated by the anti-acoustic-torpedo decoy deployed after the first explosion. While *Saskatchewan* and the three other destroyers in the group saw the U-boat's periscope several times - sometimes in very close proximity - and conducted numerous attacks upon it, as well as a similar opponent the next day, the only result was, in Easton's words, "dead or unconscious cod rising to the surface."³⁸

Compounding the difficulties faced by these ships was the lack of a coherent tactical doctrine. Some procedures had been prepared in anticipation of the Invasion, and the techniques developed to combat U-boats in deep water could be applied to some extent in shallow water, but it soon became evident that the Germans had brought new and mysterious elements to bear and a good deal more was required in response.

The first hints of new German tactics (such as resting on the bottom to avoid detection) came from prisoners of war rescued from U-boats destroyed in the English Channel as the Invasion began. The first Allied message discussing this change appears to have been promulgated on 01 July 1944.³⁹ However, it was not until 25 August that the first new tactical search plan (known as "Scabbard") that dealt with "static" tactics was adopted.⁴⁰ In other words, it took two to three months for the Royal Navy to react as an organisation to the German change.

During this transition period, the ships made do as best they could. Old tactics were adapted, or improvised plans were worked up within individual groups.⁴¹ Although this was far from sufficient, the novelty of the situation militated against more rapid development of new tactics. It was also evident that a number of new tactical procedures would have to be developed: "Scabbard" was but the first. It must also be emphasized that simply promulgating tactical procedures was only the first step in actually employing new methods; plans must be absorbed and practised by all ships before they could be effectively employed, and in the best of conditions this takes a good deal of time. In the event, it would be almost another six months

after "Scabbard" was first circulated before *Allied* anti-submarine ships began to demonstrate notable proficiency in any of the tactical techniques and procedures required to defeat schnorkel-fitted U-boats.

A further reason for the somewhat measured pace of the Allied response was that, initially, it seemed likely that U-boat operations inshore were only a passing phase dictated by the Normandy Invasion. The limitations that U-boats laboured under in shallow water were well appreciated, and Allied intelligence considered that a return to (potentially) more effective wolfpack tactics would ensue once the Germans gave up their efforts (largely futile in terms of real effect) to interdict shipping through the English Channel.⁴² As August ended, however, and the U-boats fled from the Biscay ports, firmer evidence of German intentions came to light. It became clear then that U-boats would concentrate in the coastal waters around Britain and not against mid-ocean convoys.⁴³

The Inshore Battle: Tactics and Technology

The opening operations of the U-boats in the British littoral were comparatively small in scale, mostly because the evacuation of the Biscay bases had dislocated the German navy's organisation. A handful of U-boats were sent out to what were hoped, albeit more on the basis of estimate than solid intelligence, to be the most profitable hunting areas. The most successful U-boat of this period, the *U-482*, operated in the North Channel, the area just north of Ireland where shipping from North America had been routed since the fall of France. This boat's patrol lasted from 16 August until the 26th of September, and she claimed three merchantmen, one corvette and one rescue ship, taking two of her victims only fifteen miles from the Irish coast. The success of this bold submariner in these waters came as something of a shock to the Allies, despite the experiences off Normandy. Not only were all the merchantmen in convoy when sunk,⁴⁴ but the U-boat traversed waters where a special effort had been made to detect and destroy U-boats on passage.⁴⁵ Although *U-482* was the only submarine to achieve significant success during this period, her accomplishments

made it apparent that the Allies had a long way to go in countering "static" tactics.

Command and Tactics

The analysis of *U-482's* attacks led to a change in the command arrangements between close escort groups and support groups.⁴⁶ Support groups had always been put under the control of the Senior Officer of the close escort group of whatever convoy they had been sent to support. During the period when convoys at sea were the focus of German attacks, this arrangement was entirely appropriate; support groups, which rarely stayed with any convoy for more than a day or two, necessarily had a less complete tactical picture than the Senior Officer of the close escort.⁴⁷ With the switch to static tactics by U-boats, however, the situation was radically altered. Since convoys were no longer the focus of a running battle, support groups were now tasked to operate in specific geographical areas. Convoys were still "supported" as they passed through these areas, but now the support group's knowledge of the peculiarities of a locality were far more important than the close escort's familiarity with the idiosyncrasies of a convoy. In particular, the support group's knowledge of bottom conditions and wreck locations in a local vicinity became critical. As a result, in mid-September 1944 the senior officers of support groups were made independent of the close escort when operating in support of a convoy.⁴⁸

In September 1944 the RN officially acknowledged that U-boats would probably employ static tactics. From doubting that U-boats would ever choose to bottom, the Royal Navy had swung almost completely around. In a message to all forces under his command engaged in the fight against U-boats, Admiral Sir Max Horton, Commander-in-Chief Western Approaches, put forth the view that, "When a ship in convoy is torpedoed in waters where a U-boat can bottom it should be assumed that it will do so provided immediate scaring tactics [i.e. urgent ASW attacks] are adopted."⁴⁹ Ships of the close escort were given detailed new tactics as well, which varied depending upon whether a support group was present or not. Previously developed tactical procedures, "Artichoke" by day and "Basin" by night, were adopted for the initial

reaction by the close escort to a torpedo attack. "Artichoke" called for the escorts in the van of the convoy to reverse course back through the convoy columns en route to the stricken ship. Details of "Basin" have not been found, but presumably it called for the close escort to congregate near the stricken vessel as well. Particular emphasis was placed on the importance of quick action as soon as there was evidence of the presence of a U-boat. Once the initial actions were completed, "Scabbard" was to be conducted by either a part of the close escort or, if one were available, by a support group.⁵⁰

The Admiralty summarized the new methods in a message in October 1944. This recommended stationing escorts astern of the convoy so that they could "pounce" upon a U-boat in the wake of a torpedo attack. The synopsis of U-boat intentions in the final paragraph accurately outlined the new German tactics, and stressed the change from previous methods:

U-boats can now operate inshore and are likely to adopt static tactics in place of the mobile tactics which we have been used to dealing with. Static tactics involve the use of curly and gnat torpedoes fired from U-boats which endeavour to lie in wait on the course of convoys. When no targets are available U-boats are likely to move with great caution and charge by snort [i.e. schnorkel] mainly by night. On approach of a hunting force [the U-boat] will probably bottom or may drift with tide near bottom.⁵¹

The tactical procedures developed in the late summer and early fall of 1944 remained essentially unchanged for the remainder of the inshore campaign.⁵² In practice it was not uncommon for standardized tactical procedures to be combined or slightly modified as escorts reacted to unique situations. The general principles in inshore ASW were, however, constant: quick reaction and concentration of forces in the vicinity of an attack to deter further attacks and to destroy the enemy, followed by a prolonged hunt by support group ships if the enemy, as generally happened, eluded the initial response.

Patrolling geographic areas near shipping routes where U-boats might be lurking entailed endless hours of repetitious effort, most of it to classify the innumerable wrecks and other non-



HMCS La Hullose entering port at Liverpool, England, 7 April 1945. La Hullose, a River-class frigate, worked with both Escort Group 16 out of Halifax and Escort Group 25 based in Londonderry and Rosyth. She was partially credited with the sinking of U-1302 in March 1945.

submarine contacts found in British waters. Tactical procedures for these patrols evolved with experience gained during the winter of 1944/45. Essentially there were two choices: either to proceed at slow speed so that anti-acoustic-torpedo decoys were unnecessary and maximum asdic [i.e. sonar] effectiveness was assured, or to proceed at moderately high speed, searching with decoys deployed. The first approach gave a relatively high probability of submarine detection in the swept water but covered little area, produced numerous false contacts, and gave U-boats some opportunity to evade because of the warships' slow speed of advance. The second option was less likely to detect a U-boat, but was more likely to disturb any submarine present in the search zone because of the greater area that could be swept. If enough groups were available, then a combination of these methods could be productive, because U-boats intent on avoiding the noisy high-speed groups might be ambushed by the slow, stealthy ones.⁵³ However, because there were seldom sufficient numbers in one place for this ambitious scheme, most groups alternated between the two approaches depending upon weather and asdic conditions and on the amount of time available to linger in an area.

Detection, Classification, and Prosecution

Actually locating a submarine was a serious problem throughout the campaign. The relative number of U-boat detections by asdic in the last year of the war was not markedly less than it had been in earlier years.⁵⁴ However, the comparative ineffectiveness of other detection assets (such as high-frequency direction-finding (HF/DF) of radio signals, radar or visual sightings) because of the almost constant submergence of U-boats meant that reliance on asdic was far greater. With only one effective sensor, the total number of detections dropped dramatically. Initially, this led to grave concern in some quarters that asdic did not work in shallow water. The truth was more complex. Asdic was somewhat less effective in shallow water because of the number of non-submarine contacts that confused operations there, but there were also areas in both deep and shallow water where U-boats could operate with relative impunity due to hydrographic factors. The issue in both deep and shallow water was initial detection, and the Second World War asdic was a poor sensor for this role (now known as surveillance) because of its extremely limited

range. The overall problem was not so much with asdic itself as that there were so few other detection opportunities to complement asdic searches - between mid-1941 and mid-1944 most boats had first been detected when surfaced, either by radar or visually.⁵³

Once an asdic contact was gained, the problem quickly became (as it is today) one of classification - that is, deciding whether or not the contact was a submarine. Contacts that seemed convincingly like submarines were often made.⁵⁶ Escorts were advised early in the campaign to "plaster" each one.⁵⁷ This advice was valid but obviously expensive. Not only did it result in the expenditure of an enormous amount of ordnance, but the time required to attack all contacts disrupted searches for real U-boats. The repeated detonation of large amounts of explosive in the vicinity of the escorts also caused wear and strain on the ship's hulls. Expedient classification of bottomed asdic contacts became something of a "holy grail," and escorts assiduously pursued it. Despite their best efforts, all methods remained less than satisfactory.

The size of the target as determined by asdic proved to be a rough guide at best. The sound quality of the echo returned by a contact was similarly equivocal, with many non-submarine contacts providing far sharper and clearer echoes than the real item. A bottomed contact could be identified if the vessel was equipped with an appropriate echo sounder, but this technique required a highly skilled crew. The Type 761 echo sounder provided the best results, especially if the vessel was adept enough to pass directly over a U-boat in the same direction that the U-boat was lying. This produced a trace that showed the length, breadth and height of the U-boat, including the distinctive outline of its conning tower. Even this result was not definitive, for the waters around the British Isles had become the resting place of many wrecked submarines. A comparison of the position of the contact with a chart of all known wrecks would, given precise enough navigation, provide a final determination of whether the contact was real or not. Nevertheless, even if the wreck chart indicated that the boat in question was long dead, a good echo sounder trace would warrant a cautionary attack.

Good navigation was essential to reduce the number of unnecessary attacks, and ensure that escorts remained in contact with targets that proved to be a "live" submarine. Because of the frequency of non-submarine contacts, it was not unknown for escorts to be seduced from a valid contact onto a nearby non-submarine contact. A veteran of the inshore battle recalled an incident in which one "U-boat kept us chasing all night, and I am not sure that we did not start after one U-boat and finish with another."⁵⁸ The value of an accurate and easy to use radio-navigation system while searching in such difficult waters can scarcely be overstated. In the last part of the war such a system, known as Gee, became available in the English Channel and southern Irish Sea, and many, although not all, escorts in support groups were fitted with the necessary receivers. Gee allowed escorts to differentiate between contacts as close as one thousand yards apart, and therefore enabled warships to plot wrecks quickly and accurately. Groups fitted with this equipment became very familiar with the wrecks in their assigned patrol areas after an initial period of endless contacts. Gee was so valuable that support groups that were only partially fitted complained in no uncertain terms that more sets were essential.⁵⁹

Ships also used buoys to assist in their prosecution of bottomed contacts. The "dan" buoy, a small buoy that could be anchored in a specific spot, was the recommended aid. Its employment prevented escorts from drifting inadvertently away from a contact through being either set by tide or blown by wind while the contact sat immobile on the bottom. The value of such an aid to location in the featureless sea was demonstrated on a number of occasions, and its use was continually advocated by training establishments.⁶⁰

Operational Results

The lowest point in the campaign occurred in December 1944. During that month, U-boats torpedoed 11 ships in British waters.⁸¹ No U-boats were sunk in the wake of these attacks, and only three U-boats were destroyed by anti-submarine forces in U.K. coastal waters: two by ships and one by aircraft.⁶² The total number of U-boats lost during the month was 14, but three were the result of accidents, three were bombed

in harbour, and one was from unknown causes. Although the shipping losses to U-boat attack were insubstantial in comparison to the vast flow of Allied trade now crossing the Atlantic, the impotence of anti-submarine forces was evident. It was at this point, on 6 January 1945, that the First Sea Lord expressed his serious concern (quoted above) to the Chiefs of Staff Committee. His worst fear was that the U-boats had mastered the difficulties of manoeuvring in shallow waters, and were now becoming more aggressive. If this were true, and experienced U-boat commanders began returning to spread the word that convoys could be attacked with relative impunity providing proper tactics were employed, the number of ships that might be sunk in the near future was daunting. Fuelling his anxiety was intelligence that powerful new Type XXI and XXIII U-boats would soon enter the battle. The combination of these grim possibilities led the First Sea Lord to suggest that by the spring of 1945 it was possible that the worst Allied shipping losses of the war might yet be suffered.⁶³

It did not happen that way. Only a handful of the new U-boats undertook wartime patrols, far too few to have any effect or to provide enough information to do more than speculate on what might have been accomplished. More importantly, the support groups began to gain the upper hand over the older types of U-boats.⁶⁴ The turning point came in February. While 11 merchantmen and three escorts were torpedoed around the British Isles, three U-boats were destroyed in the wake of their attacks, and, significantly, another six fell to patrolling ships before they could make any attacks. The increasing numbers of U-boats detected and destroyed before they could strike was clear evidence of the growing experience and expertise of support groups in shallow water operations.⁶⁵ Coastal Command accounted for two more U-boats, and one was shared between sea and air forces.⁶⁶ In short, the destruction of 14 ships had cost the U-boat arm 12 submarines - a devastating ratio. Nor was that all. Altogether the Germans lost 21 U-boats from all causes in all areas during February.

German losses continued to mount as the war neared its end. In April U-boats sank ten merchantmen and two escorts, but lost ten of their number to Allied escorts and six more to Coastal Command aircraft, with another one U-

boat kill was shared between the two services. The total U-boat losses for April were 55, many to bombing raids on German ports or while attempting to flee at speed on the surface from Germany to Norway as the Reich collapsed.⁶⁷

The older U-boats could no longer keep up the fight. At the end of March and in early April U-boats were ordered to move further off shore where they would again try to hide in deep waters.⁶⁸ It was a futile strategy, since it was understood that individual U-boats positioned well out to sea would sink very few merchantmen. The main result of this last measure was that fewer encounters took place between U-boats and Allied escorts. Those that did were once again in deep water. Indeed, the wheel had turned full circle. In late April 1945, the Commander-in-Chief Western Approaches reminded his forces that anti-submarine action was still possible in deep water, and in the event U-boats were detected:

...it will be necessary to forget tactics recently developed for shallow water operations and concentrate on those previously so successful in deep water.⁶⁹

In less than a year the U-boats had been forced to retire from the last area where they could possibly enjoy success. Victory was less than total, because U-boats continued to operate in the Atlantic right up to the very end, but it was far from hollow. The reason for the success of Allied anti-submarine forces clearly stems from the rapid and effective way in which the opponents of the U-boats in this last campaign adapted tactically to the challenge presented by the new style of U-boat warfare. The way in which these groups were deployed to counter the German initiative, as well as trained to deal with new tactics, illustrates the effective operational flexibility of Allied navies by this late stage of the war. Despite these successes, the period of adaptation was lengthy enough to cause distinct concern in certain circles of the Allied High Command. The delay was due partly to the requirement to identify and react to the German initiative, but it was also a consequence of the inherent difficulties of conducting ASW in shallow water. Not only did the support groups have to become proficient in new tactics, but their crews had to become accustomed to the much more complex conditions commonly

encountered in coastal waters. Only when new tactics, training and experience all came together were the Allies able to deal with the new challenge. That they were successful speaks well of their capabilities - that it took more time than many thought it should demonstrates the problems that even a veteran naval force has in adapting to new initiatives by an opponent, and to the difficulties of countering submarines in coastal waters.

Notes

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1. S.W. Roskill, *The War at Sea, 1939-1945, Volume II* (London: HMSO, 1956), pp.377-379.
2. "A Forecast of the Results of the U-boat Campaign during 1945," Memorandum by the First Sea Lord dated 6 January 1945 (C.O.S. (45) 14(0)), National Archives of Canada [NAC], Record Group [RG] 24, Vol.11752, MS 369-2.
3. The major arguments in this paper are drawn from the author's MA thesis, "The Last Cruel Winter: RCN Support Groups and the U-boat Schnorkel Offensive," Royal Military College of Canada, Kingston, Ontario, March 1992.
4. Admiralty Message C A/S O Number 6, to large distribution, 271816Z October 1944, NAC RG 24, 83-84/167, Vol.2616, File 16121-5 Vol.2.
5. F.H. Hinsley, *British Intelligence in the Second World War, Volume Three, Part II* (London: HMSO, 1988), p.462.
6. *Ibid*, p.474.
7. Schnorkel is the anglicised spelling of the German word *schnorchel*, and will be used throughout this paper except where quotations employ the Germanic form.
8. E. Rossler, *The U-boat: The Evolution and Technical History of German Submarines* (Annapolis, Maryland: Naval Institute Press, 1981), p. 198.
9. G. Hessler, *The U-boat War in the Atlantic, 1939-1945* (London: HMSO, 1989), Section 420.
10. S.E. Morison, *History of the United States Naval Operations in World War II, Volume X: The Atlantic Battle Won, May 1943-May 1945* (Boston: Little, Brown and Company, 1956), p.338.
11. The contemporary assessment by BdU of the results of their operations against the Normandy Invasion is found in the BdU War Diary entry of 30 September 1944, Directorate of History and Heritage, Canadian Department of National Defence [DHH] 79/446, Vol. 10, p.645.
12. J. Terraine, *Business in Great Waters* (London: Leo Cooper, 1989), pp.646-647.
13. BdU War Diary, "Final Summary of Submarine Operations in the Channel," 30 September 1944, pp.636-646, Volume 10, DHH 79/446. Twenty U-boats were destroyed in the course of 45 sorties during the period 6 June to the end of August 1944, in return for 19 Allied ships sunk and seven damaged. A good summary of the campaign is given in Hessler, Section 454.
14. Hinsley, Vol.3, Part II, pp.474-476.
15. W. Rahn, *Kapitan Zur See, Republique fédérale d'Allemagne*, "The Development of New Types of U-boats in Germany During the World War II," in "*Les marines de guerre du dreadnought au nucléaire*" *Actes du colloque international Paris, Novembre 1988, Service Historique de la Marine*, nd., p.362.
16. Hessler, Section 464.
17. *Ibid*, Section 459.
18. Rahn, 366.
19. This author's personal opinion is that an attempt to employ wolfpack tactics using Type XXI U-boats would have met with limited success at best.
20. Hessler, Section 442.
21. Hessler, Section 452.
22. Hessler, Sections 91 and 119; and W.A.B. Douglas, *The Creation of a National Air Force: The Official History of the Royal Canadian Air Force, Volume II* (Toronto: University of Toronto Press, 1986), p.509.
23. CB 04050/44 entitled "Inshore Operations by U-boats" dated 30 March, 1944, NAC, RG 24, 83-84/167, Vol.2616, File 16121-5, Vol.1.
24. Hessler, Section 473.
25. Hessler, Section 472. There were rare instances where U-boats chose to depart the scene of an attack by raising their schnorkel and travelling at high speed.
26. Roskill, Vol.3, Part II, p. 178; and *The RAF in Maritime War*, Volume 5, page 109, DHH 79/599.
27. N.L.R. Franks, *Search, Find and Kill: Coastal Command's U-boat Successes* (Bourne End, Bucks, England: Aston Publications, 1990), p.58; and Roskill, Vol.3, Part II, p.295.
28. Hessler, Section, 446. The difficulty of navigating in coastal waters without occasionally surfacing to fix their position caused enormous problems for the U-boats, and led to several running aground and foundering. The most dramatic illustration of the problem was the inadvertent penetration of Spithead by U-763 in July 1944 after the boat lost its bearings.
29. Hessler, Section 437. One exception to this generalization were U-boats employed in weather reporting duties in the mid-Atlantic. For a good account of the fate of one of these submarines, see D. Syrett, "Weather-Reporting U-boats in the Atlantic, 1944-45: The Hunt for U-248," *The American Neptune* (Vol.52, No.1), Winter 1992, pp.16-24.
30. Hinsley, Vol.3, Part II, p.484; and *The RAF in Maritime War*, Volume 5, p. 176, DHH 79/599.
31. Doug McLean, "The US Navy and the U-Boat Inshore Offensive", in William B. Cogar, éd., *New Interpretations in Naval History: Selected Papers From the Twelfth Naval History Symposium*. (Annapolis, Maryland: Naval institute Press, 1997).
32. Douglas, p.608.
33. D. van der Vat, *The Atlantic Campaign* (New York: Harper & Row, 1988), p.290.
34. *RCN-RCAF Monthly Operational Review*, August 1944, DHH 182.013. The ships for these support groups were found by such desperate measures as halting all convoys to Russia from March until November 1943.
35. W.T. Y'Blood, *Hunter-Killer* (Annapolis: Naval Institute Press, 1983), pp.273-274, provides a representative example of this debate, with a distinctly pro-American bias.
36. DHH ADM 223/20, November 1944. (mfM).

37. *Ibid.*
38. A. Easton, *50 North* (Toronto: The Ryerson Press, 1963), p.256.
39. Message from Commander-in-Chief, Western Approaches to long distribution, 011325Z July 1944, NAC RG 24, 83-84/167, Vol.2616, File 16121-5 Vol.1. This intelligence was repeated at the end of the month in *Admiralty Monthly Anti-Submarine Report* for July 1944, DHH Library, D780 M66 1944, Jul-Dec.
40. Board of inquiry on loss of SS *Empire Heritage* and RFA *Pinto*, covering memorandum from Admiral Horton to the Secretary of the Admiralty, dated 30 October 1944, NAC RG 24, Vol. 11718, File CS 31-1-8. "Scabbard" was also circulated in the *Admiralty Monthly Anti-Submarine Report* for August 1944, DHH Library, D780 M66 1944 Jul-Dec.
41. "Submarine Warfare in the Channel," Commander J.D. Prentice, RCN, to Commodore (D) WAPPS, 17 July 1944, NAC RG 24, Vol.11757, File D-01-18-0.
42. Hinsley, Vol.3, part 2, p.467.
43. *Ibid.*, p.466.
44. Roskill, Vol.3, Part II, p. 180.
45. Details of this operation, which was cryptically dubbed "CW," are sparse, but it is obliquely discussed in "Survey of A/U Operations in U.K. Coastal Waters July 1944-May 1945," Directorate of Naval Operational Research report 13 July 1945, DHH ADM 205/44.
46. Board of Inquiry concerning the attack on Convoy HFX 305 in the North Channel in September 1944. The attack was one of the several successful ones made by *U-482*. NAC RG 24, Vol. 11718, File CS 31-1-8.
47. *RCN-RCAF Monthly Operational Review*, August 1944, DHH 181.009 (D3188).
48. Message from Commander-in-Chief, Western Approaches to general distribution, 131903B September 1944, NAC RG 24, 83-84/167, Vol.2616, File 16121-5, Vol.2,
49. Message from Commander-in-Chief, Western Approaches to General Distribution, 131845Z September 1945. This message amended slightly a previous one sent out 9 September, placing more emphasis on the likelihood that a U-boat would bottom. NAC RG 24, 83-84/167, Vol.2616, File 16121-5 Vol.2.
50. *Ibid.*
51. Admiralty Message C A/S O Number 6, to wide distribution 271816Z October 1944, NAC RG 24, 83-84/167, Vol.2616, File 16121-5 Vol.2. "Curly" torpedoes was the generic British term applied to German-pattern running torpedoes. These were standard torpedoes equipped with either "Lut" or "Fat" devices which caused them to begin alternately turning first one direction and then another so as to repeatedly comb the intended area where a convoy was expected to pass. "Gnat" torpedoes was the British term for the German Type V acoustic homing torpedo. Details of Admiralty knowledge of German torpedoes can be found in the *Admiralty Monthly Anti-Submarine Report* for February 1945. DHH Library, D780M66, 1945.
52. A good summary of the Allied perspective in mid-winter is found in C A/S O Number 7, summarized in Commander-in-Chief Portsmouth's message of 200042Z February 1944, NAC RG 24, 83-84/167, Vol.3734, File NSS 8100-3.
53. "Note on the Deployment of A/S Forces Against U-boats Operating in British Inshore Waters" by Professor E.J. Williams, Assistant Director of Naval Operational Research in the Admiralty, 26 December 1944, NAC RG 24, 11752, MS 369-2.
54. W. Hackmann, *Seek & Strike* (London: Her Majesty's Stationery Office, 1984), p.239.
55. *Ibid.*, p.239.
56. Easton, pp.252-253.
57. *Admiralty Monthly Anti-Submarine Report*, July 1944, DHH Library, D 780 M66 1944 Jul-Dec.
58. Commander D.E.G. Wemyss, *Walker's Groups in the Western Approaches* (Liverpool: The Liverpool Daily Post & Echo Ltd, 1948), p.141,
59. "Report of Proceedings of Second Division [of EG 26] from 14 February to 8 March, 1945." DHH, NHS 8440 EG 26, File NSS 1926-EG 26,
60. *Admiralty Monthly Anti-Submarine Report* April-May 1945, pp.32-33, DHH Library, D 780 M66 1945 Jan-May. The Royal Navy also instituted a program that marked wrecks permanently. Specially designed submerged buoys, known as "Winners," sent out distinctive sonic signals that could be easily detected by asdic at a range of two to three miles. They were carefully laid 1,000 yards due north of known wrecks. Ingenious as it sounds, the success of these buoys does not appear to have been great, probably because of the abundance of wrecks around the United Kingdom, and the programme was not widespread. *Western Approaches Monthly News Bulletin*, December 1944, Part III, Page 2, D Hist 81 /520/ 1650-AS Vol.28; and Message from Admiralty to USN addressees, 030504Z January 1945, NAC RG 24, 83-84/167, Vol.2616, File 16121-5.
61. "Survey of A/U Operations in U.K. Coastal Waters July 1944-May 1945," Directorate of Naval Operational Research report 13 July 1945, DHH ADM 205/44.
62. Roskill, Vol.3, Part 2, p.466.
63. Memorandum by the First Sea Lord, "A Forecast of the Results of the U-boat Campaign During 1945," CO.S, (45) 14 (0) dated 6 January 1945, NAC RG 24, Vol. 11752, MS 369-2.
64. "Survey of A/U Operations in U.K. Coastal Waters July 1944-May 1945," D.N.O.R. report 13 July, 1945, DHH ADM 205/44.
65. DNOR Report "Survey of A/ U Operations in U.K. Coastal waters July 1944-May 1945" dated 13 July 1945, DHH ADM 205/44.
66. Roskill, Vol.3, Part 2, p.294.
67. *Ibid.*, pp.300 and 467-469.
68. Hessler, Section 479.
69. Commander-in-Chief, Western Approaches to large distribution, 282254Z April 1945, NAC RG 24, 83-84/167, Vol.2616, File 16121-5, Vol.3.

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