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# Confronting Technological and Tactical Change

## Allied Antisubmarine Warfare in the Last Year of the Battle of the Atlantic

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**T**HE 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 U-boats inflict dangerously high shipping losses.<sup>1</sup> The naval war remained bitter, however, for the U-boats refused to give up, turning instead to new technology and new tactics. Right to the end of the war, they continued to present a plausible threat, one that caused concern in high Allied circles. Indeed, by January 1945 the British Admiralty's First Sea Lord 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. . . ."<sup>2</sup>

The ensuing struggle led to a confrontation between improvised technological improvements and tactical changes on the part of the U-boats and the operational and tactical adaptations produced in reply by Allied antisubmarine 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. This campaign provides insights into how new and unexpected initiatives by an enemy can be dealt with even when no technological solutions are readily at hand. It also

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illustrates the difficulty that both submarine and antisubmarine forces encounter when operating in the challenging environment of shallow water.<sup>3</sup>

### Improvements in Submarine Technology

Somewhat paradoxically, the new challenges to Allied trade defence forces in 1944–1945 were born of the latter's very success with previous antisubmarine countermeasures. In desperation, the Germans had been forced to adopt new tactics. These new strategies featured submerged penetration of focal areas of trade by individual boats, which then lay in wait for targets of opportunity, made sudden attacks from ambush, and then immediately began extreme evasive manoeuvres that continued for prolonged periods. Unlike the massed "wolfpack" attacks against convoys that had been the hallmark of U-boat operations in 1942–1943, these so-called "static" tactics seldom caused severe Allied losses, because U-boats spent far more time avoiding detection than aggressively seeking opportunities to attack.<sup>4</sup> 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.<sup>5</sup> 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 actually becoming effective again in their attacks.<sup>6</sup>

The new equipment that allowed this dramatic change in U-boat tactics was the schnorkel.<sup>7</sup> This was a comparatively simple device that provided the boats enough air to operate their diesel engines while submerged.<sup>8</sup> Little more than a tube about as 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 a 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.<sup>9</sup> 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.<sup>10</sup> 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 did distinguish the tube's small echo 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, to their surprise, that they could operate in the most heavily defended waters.<sup>11</sup> The Allies had anticipated an aggressive response to the June 1944 invasion and had prepared a

comprehensive defence-in-depth of the Channel. Massed defending forces devastated those U-boats not yet equipped with schnorkels (at the time, a majority) but found schnorkel-equipped submarines a frustratingly difficult opponent.<sup>12</sup> 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.<sup>13</sup>

In addition, the Allies (thanks to decryption of high-level German message traffic, an intelligence source known as "Ultra") were acutely aware of the possibility of entirely new U-boat designs.<sup>14</sup> The Type XXI and Type XXIII boats were the first conventional submarines capable of rapid underwater manoeuvring.<sup>15</sup> 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.<sup>16</sup> German authorities assigned the highest priority to the production of these new types in July 1943, but the first few became operational only as the war ended.<sup>17</sup> The potential impact of these vessels on the transatlantic logistics of the Allied campaign in Europe remains one of the war's most interesting subjects for speculation; fortunately for the Allies, however, the war was fought with older (Type VII and Type IX) U-boats.

The only remaining area where these latter boats could achieve success was in the coastal zones near ports and the focal points of shipping routes.<sup>18</sup> 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, the Germans realized that they were impossible with the Types VII and IX U-boats.<sup>19</sup> The Germans were encouraged by the schnorkel-equipped submarine's ability to operate in such heavily defended coastal waters as the English Channel but were acutely aware that simply surviving was not enough.<sup>20</sup> 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 against coastal areas offered the best chance of inflicting losses on the Allies.<sup>21</sup>

## Shallow Water Submarine Warfare

With their decision to move into coastal waters using schnorkel-equipped U-boats, the Germans created a difficult problem for the Allies. Shallow water

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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.<sup>22</sup> In the first half of the war, U-boats had endeavored 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."<sup>23</sup>

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

Consequently, warships acting as close escort to World War II convoys rarely detected a U-boat in shallow water before the submarine attacked. Schnorkel-equipped U-boats 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 chances of finding targets visually.<sup>24</sup> This helped somewhat, and the U-boat's chance of being detected by the close escort before it attacked remained slight. After firing, the submarines 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.<sup>25</sup> 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. Although close escorts were still essential because they complicated the attack problem of the submarine, they were often incapable of striking back effectively in the face of the new German tactics.

Aircraft patrolled coastal waters incessantly but rarely spotted schnorkels, and they had great difficulty attacking even if an aircrew was fortunate enough actually to find one.<sup>26</sup> 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.<sup>27</sup> 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 as to their own actual position.<sup>28</sup> Radio communication with BdU, a process that both required the submarines to surface and exposed them to the efficient Allied radio direction-finding network, became extremely intermittent, which in turn contributed to a growing inability at BdU to follow operations at sea.<sup>29</sup> Overall, ASW aircraft substantially reduced the effectiveness of U-boats 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.<sup>30</sup> 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 U.S. Navy 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 travelling submerged, U.S. hunter-killer groups from then on seldom had any opportunity to show their mettle. The growing strength of the USN as the European war closed did allow that navy to "maintain nearly as many 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."<sup>31</sup> 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 countermeasures against the coastal campaign by schnorkel-equipped U-boats fell to Royal Navy and Royal Canadian Navy "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 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

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support groups was to find and destroy U-boats wherever they posed the greatest threat to shipping.

The idea of a group of escorts whose primary role was to counter U-boats was straightforward enough. Experiments in 1942 had indicated how effective such an organisation could be.<sup>32</sup> 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.<sup>33</sup>

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, which were the American equivalent of support groups when the USN reentered the Atlantic

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war in strength in 1943, emphasized the actual hunting of U-boats, using radio intelligence. The debate as to which approach was more strategically and tactically sound was a lively one at the time and has been since; however, the argument was reduced to irrelevance 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.<sup>34</sup>

The great strength of support groups (and hunter-killer groups) was that because they were not exclusively preoccupied with protecting convoys, they had great flexibility. This allowed them to adopt procedures that 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 grew to seventeen RN and seven RCN, while there were three RN and eight RCN North Atlantic close escort groups.<sup>35</sup> The predominance of the Royal Navy in support groups was partly a result of the larger size of that organisation, 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 one more suited to the RCN's capabilities.

Most of the support groups were by late in the war allocated to United Kingdom waters, which senior officers in both the Canadian and British navies appreciated was the critical area. Canadian naval officers perceived that this concentration left the Canadian coast inadequately protected, but despite the risk the Naval Staff in Ottawa recommended that the five RCN support groups under the operational control of the RN remain in United Kingdom waters "unless there is a real need for them" at home—in other words, unless intelligence provided clear indication that a large number of U-boats were en route Canadian waters or shipping losses there soared.<sup>36</sup> In simple terms, only two RCN support groups remained to protect Canadian waters, while the majority operated overseas.

Despite the advantages 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 to be an extremely challenging one. 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 the *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 both upon it and upon a similar opponent the next day, the only result was, in Easton's words, "dead or unconscious cod rising to the surface."<sup>37</sup>

Compounding the difficulties 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 that a good deal more was required in response.

The first hints of the nature of the 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 1 July 1944.<sup>38</sup> However, it was not until 25 August that the first new tactical search plan (known as "Scabbard") that dealt with "static" tactics was adopted.<sup>39</sup> In other words, it took two or three months for the Royal Navy to react as an organisation to the German changes.



During this transition period, the ships made do as best they could. Old tactics were adapted, and improvised plans were worked up within individual groups.<sup>40</sup> 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 of a series. It must also be emphasized that simply promulgating tactical procedures is only the first step in actually employing new methods; plans must be absorbed and practiced by all ships before they can 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 antisubmarine 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.<sup>41</sup> 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.<sup>42</sup>

### 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 estimates 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 experience off Normandy. Not only had all the merchantmen been in convoy when sunk,<sup>43</sup> but the U-boat had traversed waters where a special effort had been made to detect and destroy submarines on passage.<sup>44</sup> Although *U-482* was the only boat 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.** Analysis of the *U-482*'s attacks led to a change in the command arrangements between close escort and support groups.<sup>45</sup> 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 on the high seas 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.<sup>46</sup> 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.<sup>47</sup>

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."<sup>48</sup> 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 close escort's initial reaction 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 too called for the close escort to congregate near the stricken vessel. 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.<sup>49</sup>

The Admiralty summarized the new methods in a message of October 1944. This especially 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."<sup>50</sup>

The tactical procedures developed in the late summer and early fall of 1944 remained essentially unchanged for the remainder of the inshore campaign.<sup>51</sup> 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 destroy the enemy, followed by a prolonged hunt by support group ships if, as generally happened, the enemy 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 nonsubmarine contacts to be found in the English Channel and southern Irish Sea. Tactical procedures for these patrols evolved with experience gained during the winter of 1944–1945. Essentially, a group had 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 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, 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.<sup>52</sup> 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.<sup>53</sup> 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 nonsubmarine contacts that confused operations there, but there were areas in both deep and shallow water where U-boats could operate with relative impunity, due to hydrographic factors, from discovery by asdic. 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, however, so much with asdic itself as that there were in this late period so few other detection opportunities to complement asdic searches; heretofore, between mid-1941 and mid-1944, most boats had first been detected when surfaced, either by radar or visually.<sup>54</sup>

Once an asdic contact was gained, the problem quickly became (as it does today) one of classification—that is, deciding whether or not the contact is a submarine. Contacts were often made that seemed convincingly like submarines;<sup>55</sup> escorts were advised early in the campaign to “plaster” each one.<sup>56</sup> This advice was valid but obviously expensive. Not only did it result in the expenditure of an enormous amount of ordnance (maybe on “false alarms”), but the time required to attack all contacts disrupted searches for real U-boats. The repeated detonation of large amounts of explosive depth charges also caused wear and strain on the ships’ 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 only a rough guide at best. The sound quality of the echo returned by a contact was similarly equivocal, since many nonsubmarine contacts provided 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 in which the U-boat was lying. This produced a trace that showed the length, breadth, and height of the U-boat and even the distinctive outline of its conning tower. Even this data was not definitive, however, for the waters

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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 as to 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 precautionary attack.

Good navigation was essential, both 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 nonsubmarine detections, it was not unknown for escorts to be seduced from a valid contact onto a false one nearby. 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."<sup>57</sup> The value of an accurate and easy-to-use radio navigation system for 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 area 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.<sup>58</sup>

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. It 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.<sup>59</sup>

**Operational Results.** The lowest point in the campaign occurred in December 1944; during that month, U-boats torpedoed eleven ships in British waters.<sup>60</sup> No submarines were sunk in the wake of these attacks, and only three U-boats were destroyed by antisubmarine forces in U.K. coastal waters: two by ships and one by aircraft.<sup>61</sup> The total number of U-boats destroyed during the month was fourteen, but three of these losses were the result of accidents, three boats were bombed in harbour, and one was from unknown causes. Although the shipping losses to U-boat attack at this time were insubstantial in comparison to the vast flow of Allied trade now crossing the Atlantic, the impotence of antisubmarine 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

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employed, a daunting number of ships might be sunk in the near future. Fuelling the First Sea Lord's anxiety was intelligence that the powerful, new Type XXI and XXIII U-boats would soon enter the battle. The combination of these grim possibilities led him to suggest that by the spring of 1945 it was possible that the worst Allied shipping losses of the war might be suffered.<sup>62</sup>

It did not happen that way. As noted, only a handful of the new U-boats undertook wartime patrols, far too few to have any significant effect or to provide post-war analysts enough data with which to more than speculate what these modern craft might have accomplished. More importantly, the support groups began to gain the upper hand over the older types of U-boats.<sup>63</sup> The turning point came in February. While eleven 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 at all. 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.<sup>64</sup> The Royal Air Force Coastal Command accounted for two more U-boats in February, and one “kill” was shared between sea and air forces.<sup>65</sup> In short, the destruction of fourteen ships had cost the U-boat arm twelve submarines: a devastating ratio. Nor was that all. Altogether the Germans lost twenty-one 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 boat sunk by the two services together. The total U-boat losses for April were fifty-five, many during bombing raids on German ports or while the boats attempted to flee at speed on the surface from Germany to Norway as the Reich collapsed.<sup>66</sup>

The older submarines 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

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would again try to hide in deep waters.<sup>67</sup> 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 occur 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 antisubmarine action was still possible in deep water, and that in the event U-boats were detected there, "it will be necessary to forget tactics recently developed for shallow water operations and concentrate on those previously so successful in deep water."<sup>68</sup>

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—U-boats continued to operate in the Atlantic right up to the very end—but it was far from hollow. The success of Allied antisubmarine forces clearly stemmed from the rapid and effective way in which the primary opponents of the U-boats in this last campaign—Anglo-Canadian support groups—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 and how they were trained to deal with new enemy tactics illustrate the effective operational and tactical 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 time inevitably required to perceive 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 specifically to the difficulties of countering submarines in coastal waters.

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 Notes

1. S.W. Roskill, *The War at Sea, 1939-1945*, v. 2 (London: Her Majesty's Stationery Office, 1956), pp. 377-79.

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 (hereafter NAC), RG 24, v. 11752, MS 369-2.

3. The major arguments in this article are drawn from the author's master of arts 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, date-time group 271816Z October 1944, NAC, RG 24, 83-94/167, v. 2616, File 16121-5, v. 2.
5. F.H. Hinsley, *British Intelligence in the Second World War*, v. 3, pt. II (London: Her Majesty's Stationery Office, 1988), p. 462.
6. *Ibid.*, p. 474.
7. "Schnorkel" is the anglicised spelling of the German word *schnorchel*. It will be used throughout this article.
8. E. Rossler, *The U-boat: The Evolution and Technical History of German Submarines* (Annapolis, Md.: Naval Institute Press, 1981), p. 198.
9. G. Hessler, *The U-Boat War in the Atlantic, 1939-1945* (London: Her Majesty's Stationery Office, 1989), sec. 442.
10. S.E. Morison, *The Atlantic Battle Won, May 1943-May 1945*, v. 10 of *History of the United States Naval Operations in World War II* (Boston: Little, Brown, 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, Canadian Department of National Defence Directorate of History (hereafter D Hist) 79/446, v. 10, p. 645.
12. J. Terraine, *Business in Great Waters* (London: Leo Cooper, 1989), pp. 646-47.
13. BdU War Diary, "Final Summary of Submarine Operations in the Channel," 30 September 1944, pp. 636-46, v. 10, D Hist 79/446. Twenty U-boats were destroyed in the course of forty-five sorties during the period 6 June to the end of August 1944, in return for nineteen Allied ships sunk and seven damaged. A good summary of the campaign is given in Hessler, section 454.
14. Hinsley, v. 3, pt. II, pp. 474-76.
15. Wertner Rahn, "The Development of New Types of U-boats in Germany during 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, sec. 464.
17. *Ibid.*, sec. 459.
18. Rahn, p. 366.
19. The author's opinion is that an attempt to employ wolfpack tactics using Type XXI U-boats would have met with limited success at best.
20. Hessler, sec. 442.
21. *Ibid.*, sec. 452.
22. Hessler, secs. 91 and 119; and W.A.B. Douglas, *The Creation of a National Air Force: The Official History of the Royal Canadian Air Force*, v. 2 (Ontario: Univ. 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, v. 2616, File 16121-5, v. 1.
24. Hessler, sec. 473.
25. Hessler, sec. 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, v. 3, pt. II, p. 178; and *The RAF in Maritime War*, v. 5, p. 109, D Hist 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, v. 3, pt. II, p. 295.
28. Hessler, sec. 446. The difficulty U-boats had in navigating in coastal waters without occasionally surfacing to fix their position caused enormous problems for them and led to several running aground and foundering. The most dramatic illustration of the problem was the inadvertent penetration of Spithead by the U-763 in July 1944 after the boat had lost its bearings.
29. Hessler, sec. 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, 1944-1945: The Hunt for U-248," *The American Neptune*, Winter 1992, pp. 16-24.
30. Hinsley, v. 3, pt. II, p. 484; *The RAF in Maritime War*, v.5, p. 176; and D Hist 79/599.
31. Douglas, p. 608.
32. D. van der Vat, *The Atlantic Campaign* (New York: Harper & Row, 1988), p. 290.
33. RCN-RCAF Monthly Operational Review, August 1944, D Hist 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.



34. W.T. Y'Blood, *Hunter-Killer* (Annapolis, Md.: Naval Institute Press, 1983), pp. 273-74, provides a representative example of this debate, with a distinctly pro-American bias. The USN particularly emphasized the use of escort carriers (CVEs) in these groups. The RN also used CVEs to assist in ASW from time to time but had too few of these vessels to make it a common practise the way the USN did. While CVEs had proved devastatingly effective in the mid-war period, they experienced considerable frustration against schnorkel-equipped U-boats, so much so that many were assigned to other duties. See Y'Blood, p. 257.

35. D. Hist ADM 223/20, November 1944 (microfilm).

36. *Ibid.*

37. A. Easton, *50 North* (Toronto: The Ryerson Press, 1963), p. 256. Easton discovered after the war that both torpedoes were fired from approximately one thousand yards. On 8 June Easton saw his first schnorkel and did not realise what it was until another ship opened fire on it. He also describes his experience with another new German tactic, which was to launch a balloon with a radar decoy attached that simulated the small and erratic movement a U-boat schnorkel or periscope might exhibit. The novelty of dealing with inshore U-boats is well portrayed in the section from page 252 to 263.

38. Message from Commander in Chief Western Approaches to wide distribution, 011325Z July 1944, NAC, RG 24, 83-84/167, v. 2616, File 16121-5, v.1. This intelligence was repeated at the end of the month in Admiralty Monthly Anti-Submarine Report for July 1944, D Hist Library, D 780 M66, 1944, Jul.-Dec.

39. 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, v. 11718, File SC 31-1-8.

Scabbard was also circulated in the Admiralty Monthly Anti-Submarine Report for August 1944 (quoted below in its entirety). Admiralty Monthly Anti-Submarine Reports Jul.-Dec. 1944, D Hist Library, D 780 M66 1944 Jul.-Dec.

#### Operation "Scabbard"

The following is an appreciation of likely U-boat action subsequent to torpedoing of a searching vessel in coastal waters.

U-boat will hottom after firing.

When hottomed she will lie to the tide.

The most probable area lies between circles at radius 2,500 yards and 4,000 yards around the wreck.

The following search operation "SCABBARD" has been designed to detect a U-boat that is believed to have bottomed after torpedoing an escort vessel of a searching force.

One ship closes the position of the torpedoing to obtain information from survivors and to provide a datum point, dropping rafts if necessary. All other ships form up 5,000 yards from the wreck so as to carry out a line abreast sweep of the area (given in paragraph 2), across the tide and allowing for the tide. Ship providing datum point either joins the sweep when organised or acts as in last paragraph.

Distance apart of ships to be:—

Three ships present ..... 3,000 yards

Four ships present ..... 2,000 yards

Five ships present ..... 1,500 yards

Having completed the sweep across, ships turn 180 degrees together and sweep back across the area, dropping depth-charges at frequent intervals.

One ship is then detached to pick up survivors and the remainder carry out a box search, using "EI" turns, the inside limits of the search being tangents to the outer limit of the probability area.

40. "Submarine Warfare in the Channel," Commander J.D. Prentice, RCN, to Commodore (D) WAPPS [Western Approaches], 17 July 1944, NAC RG 24, v. 11575, File D-01-18-0.

41. Hinsley, v. 3, pt. II, p. 467.

42. *Ibid.*, p. 466.

43. Roskill, v. 3, pt. II, p. 180.

44. 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, D Hist ADM 205/44 (hereafter DNOR).

45. 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 the U-482. NAC, RG 24, v. 11718, File CS 31-1-8.

46. RCN-RCAF Monthly Operational Review, August 1944, D Hist 181.009 (D3188).

47. Message from Commander in Chief Western Approaches to general distribution, 132331Z September 1944, NAC, RG 24, 83-84/167, v. 2616, File 16121-5, v. 2.

The Royal Navy continued to seek a better command arrangement between close escorts and support groups even after the end of the war. In a proposed change to Atlantic Convoy Instruction (ACI) 166, dated 13 July 1945, which dealt with the "Conduct of Support Groups," three types of support were defined:

- *Support*—assist senior officer of the close escort group;
- *Join and Conduct*—assist convoy, but the senior officer of the support group directs antisubmarine operations while in his area; and
- *Cover*—search for U-boats in the vicinity of a convoy, but close escort group and support escort group remain distinct and separate.

The last two definitions clearly reflect the experience of the last winter of the war, while the first harks back to situations common in the mid-war period. NAC, RG 24, 83-84/167, v. 634, File S-1837-84.

48. Message from Commander in Chief Western Approaches to general distribution, 132331Z September 1945. This message amended slightly a previous one sent out 9 September, the newer message placing more emphasis on the likelihood that a U-boat would bottom. NAC, RG 24, 83-84/167, v. 2616, File 16121-5, v. 2. "Scaring tactics" are not strictly defined in any of these messages but the term presumably refers to the generous use of depth charges in a random manner and aggressive investigation of areas where a U-boat has definitely disclosed its position—usually, in this phase of the war, by firing a torpedo.

49. *Ibid.*

50. Admiralty Message C A/S O Number 6, to wide distribution 271816Z October 1944, NAC, RG 24, 83-84/167, v. 2616, File 16121-5, v. 2.

"Curly" was the generic British term applied to German pattern-running torpedoes. These were standard torpedoes equipped with either "Lut" or "Fat" devices that caused them to begin turning, first one direction and then another, so as to continue repeatedly the intended area where a convoy was expected to pass.

"Gnat" 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. Admiralty Monthly Anti-Submarine Reports Jan.-Jun. 1945, D Hist Library, D 780 M66, 1945.

51. 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, v. 3734, File NSS 8100-3.

52. E.J. Williams, "Note on the Deployment of A/S Forces Against U-boats Operating in British Inshore Waters," 26 December 1944, NAC, RG 24, 11752, MS 369-2. Professor Williams was Assistant Director of Naval Operational Research in the Admiralty.

53. W. Hackmann, *Seek & Strike* (London: Her Majesty's Stationery Office, 1984), p. 239.

54. *Ibid.*, p. 239.

55. Easton, pp. 252-53.

56. Admiralty Monthly Anti-Submarine Report July 1944, D Hist Library, D 780 M66, 1944, Jul.-Dec.

57. D.E.G. Wemyss, *Walker's Group in the Western Approaches* (Liverpool: The Liverpool Daily Post & Echo Ltd., 1948), p. 141.

58. "Report of Proceedings of Second Division [of EG 26] from 14 February to 8 March, 1945," D Hist, NHS 8440 EG 26, File NSS 1926-EG 26.

59. Admiralty Monthly Anti-Submarine Report April-May 1945, pp. 32-33, D Hist 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 one thousand yards due north of known wrecks. Ingenious as it sounds, the success of the scheme does not appear to have been great, probably because of the abundance of wrecks around the United Kingdom; the programme was not widespread.

Western Approaches Monthly News Bulletin, December 1944, pt. III, p. 2, D Hist 81/520/1650-AS v. 28; and message from Admiralty to USN addressees, 030504Z January 1945, NAC, RG 24, 83-84/167, v. 2616, File 16121-5.

60. DNOR.

61. Roskill, v. 3, pt. II, p. 466.

62. "A Forecast of the Results of the U-boat Campaign."

63. DNOR.

64. DNOR.

65. Roskill, v. 3, pt. II, p. 294.

66. *Ibid.*, pp. 300 and 467-69.

67. Hessler, sec. 479.

68. Commander in Chief Western Approaches to wide distribution, 282254Z April 1945, NAC, RG 24, 83-84/167, v. 2616, File 16121-5, v. 3.

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### The Ernest M. Eller Prize

The Naval Historical Center and the Naval Historical Foundation are pleased to announce the award of the 1992 Ernest M. Eller Prize in Naval History to Dr. Steven J. Dick, of the U.S. Naval Observatory, for his article "Centralizing Navigational Technology in America: The U.S. Navy's Depot of Charts and Instruments, 1830-1842," published in the July 1992 issue of *Technology and Culture*. Professor William M. McBride, of James Madison University, was awarded an Honorable Mention in the 1992 Eller Prize competition for his article, "Strategic Determinism in Technology Selection: The Electric Battleship and U.S. Naval-Industrial Relations," published in the April issue of *Technology and Culture*.

Dr. Dick's essay examines how the Navy sought to apply technology to solve problems related to oceanic navigation and highlights the role played by junior officers in providing the impetus for centralizing navigational technology. Professor McBride's article discusses how strategy and technology shaped and defined the relationship between the Navy and American industry in the early twentieth century.

The purpose of the Eller Prize, which includes an honorarium of \$1,000, is to encourage excellence in research, writing, and publication on the history of the U.S. Navy. Nominations for articles published in scholarly journals in 1993 may be sent to: Senior Historian, Naval Historical Center, Washington Navy Yard, 901 M. Street SE, Washington, D.C., 20374-5060. Articles will be judged on the originality of their contribution to naval history and on their scholarship and must be submitted no later than 1 March 1994.