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Article

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# THE ROYAL NAVY AND ORGANIZATIONAL LEARNING

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## The Western Approaches Tactical Unit and the Battle of the Atlantic

Geoffrey Sloan

*Our Atlantic trade is suffering very severe losses from U-boat and air attacks in the Western Approaches. Our merchant shipping is causing grave and increasing anxiety. Anti-invasion trade protection requirements in the North Sea and narrow waters and our many commitments overseas at the present time do not allow us to increase the numbers of naval escorts allocated to Atlantic trade. Increased protection can only be given by operating our naval and air forces from bases in Eire nearer to the area of enemy attack.*

CHIEFS OF STAFF, MEMORANDUM, "NECESSITY FOR BASE FACILITIES IN EIRE," MARCH 8, 1941

*The highest type of naval officer is that wherein great professional knowledge is added to force of character. The danger within the Navy itself is lest insufficient importance should be attached to the results of study, and lest the value of what is called the practical character should be placed higher than it deserves. It is true that no student will ever become a victorious leader unless he is also a practical seaman and has the power of influencing men; but it is also true that no seaman, however practical, will be fit to rise beyond a certain rank unless he has thought out the problems of his calling as a student and has omitted no opportunity of acquiring the knowledge that makes up the science of his profession.*

MEMORANDUM DEALING WITH THE ENTRY, TRAINING, AND EMPLOYMENT OF OFFICERS AND MEN OF THE ROYAL NAVY AND OF THE ROYAL MARINES, 1902

These epigraphs illustrate two things: first, the geostrategic challenge the Royal Navy faced between the fall of France in June 1940 and the D-day landings of June 1944; second, the importance of fusing professional education, leadership skills, and the practical ability of the seaman.<sup>1</sup> The factors in the latter point can be attributed to Admiral John A. "Jacky" Fisher, RN, the reforming First Sea Lord of the early twentieth century.<sup>2</sup> Why was this synthesis important? Fisher believed it would increase the operational effectiveness of naval officers, and in

that early part of World War II, the Battle of the Atlantic might have been lost if naval officers did not become sufficiently effective.

This article will explore two related questions. First, can a theory of organizational learning be applied to explain the improved effectiveness of one tactical organization during the Second World War? That improvement can be characterized specifically as the development of an antisubmarine tactical doctrine between 1942 and 1945 and the acquisition of new knowledge in the operational context of the Battle of the Atlantic. Second, was a new organization, the Western Approaches Tactical Unit (WATU)—despite being a product of a bureaucratic, centrally controlled, hierarchical Admiralty—able to collect, transfer, and integrate knowledge to achieve three objectives: challenge existing norms, objectives, and policies that pertained to trade defense; facilitate doctrinal innovation to counter the tactics of German U-boats used to attack convoys; and teach and disseminate doctrine to naval officers appointed to escorts in the North Atlantic and officers from the Coastal Command of the Royal Air Force (RAF)?

The article will render a judgment regarding the extent to which WATU's activities enhanced the effectiveness of trade defense. Did it resolve what Max Visser has called "the 'learning paradox' and . . . combine conditions of hierarchy and discipline with adaptability and flexibility"?<sup>3</sup> Finally, does this analysis represent a historically specific case, or are there lessons for other navies to learn in the twenty-first century?

In addressing these questions, it is important to acknowledge that a body of research into these topics exists already. How do military organizations fail, innovate, and learn? The literature covers all three categories.<sup>4</sup> With respect to the first category, Eliot Cohen and John Gooch developed what they have called a "taxonomy of misfortune." They claim that "there are three kinds of failure: a failure to learn, a failure to anticipate, and a failure to adapt. Each has its own characteristics and consequences."<sup>5</sup> In terms of the second category, Williamson Murray and Allan Millett have argued that there are three patterns of innovation: technology, organizational politics, and civil-military collaboration. How they combine to facilitate innovation is more complex; it is "a combination of astute political support and guidance usually exercised by a few politicians, attention of civilian and military technologists to the most promising innovations, and creation of staffs and organizations that can turn ideas into experimental exercises."<sup>6</sup>

Fighting organizations can produce distinct attitudes to learning that can persist over long periods. Robert Foley and Sergio Catignani have examined the British army's approach to learning in both the First World War and the recent campaign in Afghanistan.<sup>7</sup> Aimée Fox-Godden has summarized their conclusions in the following way: "Both highlight the army's reliance on informal learning methods owing to an organizational culture that centres on pragmatism and

dislike of formal doctrine. Although they acknowledge the army's utilization of formal learning systems, both argue that learning and knowledge sharing take place through predominantly informal, individualized methods."<sup>8</sup>

These areas of research can be applied to the WATU case to help analyze the organizational learning that took place and its effectiveness. WATU has received scant treatment in the literature on the Battle of the Atlantic. Cohen and Gooch do not mention it by name, but they recognized it as being of coequal importance with operational intelligence. "The British anti-submarine effort, clearly the most successful of any of the participants in World War II, succeeded in large part because of their ability to master these two requirements of ASW [antisubmarine warfare]: efficient collection, collation, and communication of intelligence and development of appropriate doctrine."<sup>9</sup>

## THEORIES OF INSTITUTIONAL LEARNING

A theory of learning can be useful for understanding how the process takes place within an organization, but scholars and experts disagree regarding these theories. Some claim that knowledge capable of changing the performance of an organization can be formulated, captured, and translated into a set of codified instructions, which then can be disseminated within the organization.<sup>10</sup> In contrast to this claim is the idea of knowledge as a "multifaceted, dynamic, provisional and socially situated activity where context and interpretative frames are essential."<sup>11</sup> This second theory has much to recommend it, as it acknowledges that a changing social context can affect attempts to interpret and learn about a new, challenging situation.<sup>12</sup> There is also a theory that lies between these two poles: the theory of absorptive capacity. This states that the "ability to evaluate and utilize outside knowledge is largely a function of the level of prior related knowledge[,] . . . [which] confers an ability to recognize the value of new information, assimilate it, and apply it."<sup>13</sup>

Chris Argyris and Donald Schon call into question all three of these interpretations of learning: as a set of codified instructions, a socially situated activity, or a theory of absorptive capacity. They object that each of these theories claims to understand and account for a complex reality, yet "no single perspective gives a workable basis either for diagnosing the impediments to organizational learning or for designing interventions which would increase the organizational capacity for learning."<sup>14</sup>

Argyris and Schon developed two theories on how organizations learn. The first is called single-loop learning. The analogy is to a thermostat; it "learns when it is too hot or too cold and turns the heat on or off. The thermostat can perform this task because it can receive information (the temperature of the room) and take corrective action." The second theory is called double-loop learning. This

occurs when an individual or organization receives information and takes action, but the outcome is not the desired result. Developing remedial action requires assessing the core features of the organization, which leads to errors being “detected and corrected in ways that involve the modification of an organization’s underlying norms, policies, and objectives.”<sup>15</sup>

A crucial difference between these two types of learning is the ease with which organizations can perform them. Single-loop learning is an achievable task for most organizations; double-loop learning, by contrast, presents a complex challenge. With respect to the former, as long as the objectives and the context remain the same, the process of detection and correction will continue successfully. However, a context that changes or objectives that no longer are achievable can lead to questioning of the organization’s underpinning norms or assumptions. At this point, problems can arise inside an organization; barriers to organizational learning can emerge. “Individuals and organizations tend to deal with threat in ways that will increase defensiveness and reduce the probability of learning to learn.”<sup>16</sup> Argyris and Schon contend that not all change has a positive effect on an organization. It can result in regression, stagnation, deception, and manipulation.

Institutional learning depends in part on the culture of an organization and the extent to which it facilitates an openness to both inquiry and new ideas.<sup>17</sup> Fighting organizations often have a unique culture that persists over a long period—and that can both impair learning and enhance it. The German army provides a good example of both impaired and enhanced learning. “[T]he military culture that supported the Prusso-German approach to war had taken over a century to evolve. . . . German commanders had had to *learn* to devolve creative freedom and authority upon their juniors—an unprecedented and largely counterintuitive step.”<sup>18</sup>

Argyris and Schon made a number of claims that differentiate double-loop learning from single-loop learning. First, it is relatively hard for an organization to create this kind of learning system; second, it cannot be evolved from single-loop learning; finally, it is best suited to a complex environment in which there are many interacting variables. But when implemented successfully, it can have long-term benefits. “Double-loop actions—the master programs—control the long-range effectiveness, and hence, the ultimate destiny of the system.”<sup>19</sup> The challenge that WATU faced certainly qualified as just such a complex environment.

## THE QUADRANTS OF FIGHTING POWER: A MEANS OF ANALYSIS

Traditionally, fighting power has been interpreted using three elements: the moral, the physical, and the conceptual. A traditional instrument for facilitating navigation is the quadrant, which has a graduated ninety-degree arc. Fusing the

quadrant's arc with the elements of fighting power provides a new, hybrid way to assess the effectiveness of WATU's role in the improvement of ASW tactics. The quadrants used here with respect to the Battle of the Atlantic are four variables: new assumptions about tactics, changes in weapons technology and their subsequent application, developments in doctrine, and the adoption of an appropriate command philosophy. When all, or at least a majority of, these elements were present, WATU was facilitating a process of institutional learning.

The quadrants help illuminate two other issues. First, to what extent did senior officers, in a hierarchical organization, pursue their own agenda and succeed in shaping the manner in which the rest of their command interpreted experiential evidence? Second, to what degree do these quadrants help us understand the relationship between the tactical battle and operational effectiveness in the North Atlantic and the fulfillment of Britain's strategic objectives?

## THE CONTEXT: GEOSTRATEGIC DEFICITS AND DISRUPTIVE TECHNOLOGY

The Royal Navy's campaign in the North Atlantic was one of the most important it fought during the Second World War. This section is not intended to give a narrative account of this campaign but to focus on particular aspects of the Battle of the Atlantic.<sup>20</sup> What defined the campaign was the need to parry and defeat the disruptive technology of Germany's U-boats.<sup>21</sup> Three geostrategic deficits had emerged by July 1940, which compounded this challenge.

### *Sea Control and Sea Denial*

The first deficit was the Royal Navy's inability by July 1940 to enforce sea control and sea denial in the Western Approaches. This was a consequence of a decision made in the late 1930s. In April 1938, an agreement between the British and Irish governments brought to an end a long-standing trade and financial dispute that had been instigated by Eamon de Valera, the Irish prime minister. Part of that agreement, at the insistence of the British prime minister, Neville Chamberlain, was the relinquishment of what were called *defended reserved ports*. These had remained under British control even after the secession of the south of Ireland from the United Kingdom in 1922.<sup>22</sup> These naval ports were located in Lough Swilly in Donegal, Berehaven in Bantry Bay, and Haulbowline Island near Cork.<sup>23</sup> Despite strategic arguments by Winston Churchill in the House of Commons against this decision, the handover date was set for December 31, 1938—eight months before the outbreak of the Second World War.<sup>24</sup>

With those ports unavailable, a set of geopolitical assumptions emerged that were not validated by subsequent events. Admiral Ernle Chatfield, RN, the First Sea Lord in 1938, stated in his autobiography that the loss of these ports in Eire

had no geostrategic consequences, an assertion that would be proved wrong by later events.<sup>25</sup> The ability to enforce sea control and sea denial in the Western Approaches was contingent on the following: “With a French ally with an efficient navy, and a neutral, but friendly Norway, the Admiralty believed they could hold the position. Actually, their judgement in the envisaged circumstances proved right; the situation was held satisfactorily until the fall of Norway and the collapse of France.”<sup>26</sup> But those losses did occur, and by June 1940 Britain found itself—for the first time since the Williamite wars of 1689–97—without access to naval bases along the southwest coast of Ireland. Captain Stephen W. Roskill, RN, gave an incisive judgment about the consequences of this handover. “Had we enjoyed the use of the Eire bases, many Allied ships and seamen’s lives would have been saved, and perhaps the Atlantic battle won earlier.”<sup>27</sup>

During the First World War it was the introduction of convoys in 1917 that had defeated Germany’s antiaccess/area-denial strategy.<sup>28</sup> These convoys were organized by a joint British and American command from Admiralty House in Queenstown near Cork—one of the ports that was no longer available in the Second World War.<sup>29</sup>

### *Convoy Routes*

The second geostrategic deficit was another consequence of Chamberlain’s 1938 decision. The Admiralty was forced to abandon—after the fall of France in June 1940—the Western Approaches as a convoy route. Instead, all convoys for the rest of the war would go “north about Ireland.” The difficulty in sustaining this new convoy route was compounded by a lack of naval escorts and radar equipment (both air and seaborne) to cover this area.<sup>30</sup>

The German U-boat command appreciated what was happening and made its dispositions accordingly.<sup>31</sup> The result was that between July and October 1940, a total of 282 ships were sunk off the northwest approaches of Ireland. This represented a total of 1,489,795 tons of merchant shipping. A German navy report described the effects of these vulnerabilities. “There were at times surprisingly high sinking figures in successive short operations near the North Channel. The U-boats pursued homeward-bound ships close in to the coast and attacked convoys whose escorts could not deal even with single U-boat attacks.”<sup>32</sup>

The operational issue was the absence of a basing structure to support the convoy route Britain had been forced to adopt. Londonderry came into use as a base starting in October 1940, but only for refueling. This operational deficit remained unchanged until March 1941, when the Chief of Naval Operations of the U.S. Navy approved the construction, in secret, of two naval bases in Northern Ireland, one in Londonderry and a flying boat base on Lough Erne.<sup>33</sup> Construction began in June 1941—six months before the U.S. entry into the war. These

two bases became operational in February 1942. They created a new geostrategic context that increased both the accessibility and the mobility of the Allied navies.

An additional problem was the scarcity of naval escorts available for convoy duties and the operational range of those in service. In the critical months between July and October 1940, only one or two escorts accompanied each convoy. Furthermore, their range was limited to 200–50 miles west of Ireland, owing to the absence of naval facilities in neutral Eire. U-boats could operate to the west of the escorts' operational range in the Atlantic. It was not until June 1941 that the Royal Navy initiated the use of end-to-end naval escorts for transatlantic convoys. By that date U-boats had sunk a total of 812 merchant ships.

### *U-boat Bases in Western France*

The third geostrategic deficit was a consequence of the surrender of the French government in June 1940. Germany began to construct a string of new U-boat bases down the western seaboard of France, from Brest to Bordeaux. Out of the small force of fifty-seven German U-boats, forty-nine were operational, and the new bases provided a critical advantage, increasing the geographical scope of the boats' operations.

The geostrategic significance of the absence of Allied bases in Eire became acute. As early as 1909 Sir Halford Mackinder had commented that Britain never "had to face enemies simultaneously eastward and southward," except during the Napoleonic Wars.<sup>34</sup> Now the relative accessibility of the Western Approaches from the western seaboard of France resulted in the reoccurrence of this scenario.

### *Other Challenges*

In countering the disruptive technology of the submarine, the Royal Navy failed to remember a lesson of the First World War. "The British basically forgot that convoys alone had played the crucial role in blunting the U-boat offensive in 1917."<sup>35</sup> It was access to southern Irish ports and bases that made the formation and routing of convoys effective. Second, the Royal Navy made a series of assumptions in the 1930s about the nature of the threat it would face and how it would counter that threat. Heavy reliance was placed on asdic (a submarine location device named after its progenitor, the Anti-Submarine Detection Investigation Committee), a primitive form of sonar that was believed widely to be a technological solution for any future threat.<sup>36</sup>

These assumptions were expressed by a representative of the First Lord of the Admiralty at the first meeting of the Shipping Defence Advisory Committee in March 1937, two and a half years before Britain entered the Second World War.<sup>37</sup> He stated that the United Kingdom faced three forms of attack: the airplane, the surface warship, and the submarine. Some claimed that the threat that the

submarine represented could be countered by technology alone. “[T]he submarine menace . . . will never be, in my opinion and in the opinion of the navy, what it was before. We have means of countering a submarine which are very effective and which will normally reduce our losses from that weapon. It will never to my mind be a fatal menace that it was in the last war. We have taken effective steps to prevent that.”<sup>38</sup>

However, the combination of the operational limitations of asdic and the geostrategic deficits noted above presented the Admiralty with a toxic problem.<sup>39</sup> The Allies could contemplate projecting power onto the European continent and defeating the Third Reich only if there could be a buildup in Britain of men and matériel. This could be done only once the U-boat threat had been defeated so that convoys could carry the men and matériel safely to the United Kingdom. In addition, Britain needed to import a critical tonnage of food and materials if it were to continue to feed its population and sustain itself in the war. The North Atlantic was the vital theater for this movement of goods. The operational challenge was to ensure the safe and timely arrival of the convoys at British ports, especially prior to the entry of the United States into the war.

By the end of 1940, both sides recognized that the war could be won and lost in the North Atlantic. German admiral Karl Dönitz, head of the submarine arm of the Kriegsmarine, had calculated in 1942 that if Germany could inflict a monthly loss of seven hundred thousand tons of Allied shipping, Germany would win the war in Europe. This was an overestimate; more likely, six hundred thousand tons would have done the trick. The latter figure constitutes the Admiralty’s calculation of the minimum that had to be sustained if the Allied cause were to continue.<sup>40</sup>

In addition to the inadequacy of asdic and the loss of southern Irish naval bases, there were some additional institutional impediments. One of the most debilitating was the persistence, and indeed the resilience, of an inappropriate command philosophy, as described by Captain Donald Macintyre, RN. “The first few months were disappointing. Contact with the enemy was rare, mainly because of mistaken tactics employed by our command ashore. We were sent on one wild goose-chase after another to the positions of the latest sinkings, only to find—as expected—that the guilty U-boat had fled the scene and was hidden in the deepfield.”<sup>41</sup> Pitted against them was a U-boat service whose ability to innovate was impressive. “Innovative tactics from August 1940 onward produced impressive results. Attacking on the surface and at night and in packs struck terror into the hearts of mariners and sank shipping as fast as the torpedo tubes could be reloaded.”<sup>42</sup> The ability of the U-boats to apply this new doctrine and the Admiralty’s unwillingness to allow the on-scene RN commander to use his judgment produced a real handicap, as this excess of control was contrary to

a devolved command philosophy that went back to the Elizabethan navy. The development of shore-to-ship wireless communication at the beginning of the twentieth century eroded this command philosophy, and the reluctance of commands ashore to devolve responsibility to commanders at sea persisted into 1941. Macintyre referred to a trip in February of that year: “Throughout the trip the escorts were subjected to all those interferences by the staff ashore about which we sea-captains had for so long felt bitter. The senior officer was unable to use his own judgement; the ships under his command were sent off on vain chases by orders from ashore.”<sup>43</sup>

## CHALLENGING ASSUMPTIONS AND NEW ORGANIZATIONAL LEARNING

The fall of France and the heavy losses off the northwest coast of Ireland prompted some institutional changes in the Royal Navy. In February 1941, Western Approaches Command was moved from Plymouth to Liverpool, where a combined area headquarters was set up. It was to remain there for the rest of the war.

The change of location did not resolve the problems the Royal Navy faced with respect to ASW. This was reflected in Admiralty personnel appointments. The biographer of Captain Frederick Walker, RN, provides insight into this:

It seemed that by design or accident all the misfits of the navy had congregated at Liverpool. Among his brother officers were many of his own kind—“passed overs”—who at some stage or other had become red-tape rebels. But the vast majority were officers of the Royal Naval Volunteer Reserve, week-end sailors churned out by the recruiting machine often with inadequate training. The Royal Naval Reserve, those independent merchant men who would become sore boils in big ship wardrooms, somehow fitted in here by providing their expert seamanship to balance the ignorance of the willing, but the lamentably “green,” RNVN.<sup>44</sup>

Given these disparate levels of experience, the need to disseminate and apply tactical doctrine consistently was vital. On the plus side, Western Approaches Command made a decision to form escort groups in February 1941, which would “work-up and train together and remain as self contained groups. The object was to protect convoys with efficient teams rather than with groups thrown haphazardly together.”<sup>45</sup>

The irony was that when the war started the Royal Navy had in place an authorized doctrine for convoying.<sup>46</sup> However, the doctrine assumed the main threat would come from German surface ships, and the use of the disruptive U-boat technology threw the Admiralty off balance.

[S]ixty-one percent of the ships sunk in convoy were the victims of night U-boat attack which came as a complete surprise to the British. But had the lessons of

World War One been studied, when the Germans had employed the same tactics, and indeed, had we read a book Donitz himself wrote between the wars in which he recounted his experiences of night attack on Allied convoys and advocated the use of these tactics in any future conflict, we might have been better prepared. He also publicly advocated the operation of U-Boats in wolf-packs and for which we were also unprepared.<sup>47</sup>

It also has been argued that Wilhelm Marschall pioneered this tactic and the German navy developed it using torpedo boats during the 1920s, when the service was forbidden to have submarines under the Versailles settlement.<sup>48</sup>

These challenges were compounded by the fact that the Royal Navy had yet to address successfully the premier Clausewitzian question. What kind of conflict, at a tactical level, did it face in the Atlantic? “Professor Patrick Blackett, Director of Naval Operational Research, highlighted the problem when he calculated some 60 percent of shipping losses could have been avoided, at least in part, if the less efficient groups had been raised to the standard of the more effective ones.”<sup>49</sup>

The creation of WATU in January 1942 meant that there now existed an institution that could collect, transfer, and integrate knowledge that would lead to three things: challenging existing norms, objectives, and policies that pertained to trade defense; facilitating adaptation and countering the tactics German U-boats used to attack convoys; and teaching doctrine efficiently and disseminating it. The unit, which represented the Admiralty’s response to the shortcomings of trade defense in the North Atlantic, was located on the top floor of Derby House in Liverpool. It was set up in response to one of the recommendations of the Battle of the Atlantic Committee that Winston Churchill (British prime minister since May 1940) had set up to coordinate issues and address the problems that convoys and naval escorts faced. The officer appointed to command this new unit was Captain Gilbert Roberts, RN; the commander in chief of Western Approaches Command at this time was Admiral Sir Percy Noble. WATU’s initial aims were twofold: first, to end the incoherent tactics that had permeated trade defense since the start of the war; and second, to enable improvements in organizational practices and norms to be devised and disseminated.

The importance of a systematic approach was articulated in 1915 by one of the most original thinkers in the U.S. Navy, Captain Dudley Knox. “The big questions of policy should first be settled as well as those of command, strategy, tactics, logistics, and matériel. Then from such basic decisions minor doctrines may be reasoned to flow logically and consistently.”<sup>50</sup> WATU was pivotal to the learning process that would take place. It also attracted curiosity at the highest level: “Churchill was extremely anxious about the Atlantic situation. Many questions worried him: ‘Was the Asdic any good? Is the depth charge inefficient? What do the escorts *do* when their convoy is attacked?’”<sup>51</sup>

Signals intelligence—or the lack of it—had an important impact on merchant shipping losses. “February 1942 saw a new variation of the Enigma system initiated by the German navy for its U-boats that Bletchley Park was unable to decipher for nearly eighteen months.”<sup>52</sup> The Allies were suddenly blinded to U-boat movements at the worst possible time. With the United States in the war, there were fresh targets for greatly reinforced U-boat wolf packs in the North Atlantic and off the coasts of South America and Africa. British and Allied losses in 1942 were 56 percent higher than in 1941.”<sup>53</sup> It is important to remember that U-boat control also was reading Allied signal traffic.

### CHALLENGING NORMS, OBJECTIVES, AND POLICIES

The initial operational question that WATU addressed was as follows: How did the German U-boats operate tactically when attacking the convoys? The challenge for the British was to formulate, disseminate, and apply a tactical doctrine with an appropriate command philosophy that would lessen the losses of merchant shipping and enable the defenders to destroy more U-boats.

#### *Roberts’s First Attempt*

Captain Roberts initially focused on collecting an experiential source of knowledge. He made it his practice to talk to escort commanders as they came into Liverpool, Greenock, and Londonderry. There was one pivotal question: “When you are with a convoy at night and a ship is torpedoed, what do you do? They all talked about ‘going to action stations,’ ‘increasing speed,’ and so on but really the answer was nothing.”<sup>54</sup>

In addressing this problem, Roberts was aided by an important precedent that already existed within the Royal Navy: the prerogative of naval officers, from the rank of captain upward, to formulate and disseminate their own tactical doctrine—a practice Nelson had used successfully when preparing for the Battle of Trafalgar. Naval historians refer to his tactical doctrine as the Trafalgar Memorandum. Its historical antecedents go back to the seventeenth century. “In the Royal Navy, the existence of a formal doctrine can be traced back to the original Fighting Instructions, first issued to the fleet over three hundred years ago in 1672, and to a Code of Tactical Signals promulgated during the Commonwealth in 1653. Admirals Howe, Kempenfelt, and Popham subsequently improved tactical doctrine with the issue of the Signal Book in 1799 and Popham’s Marine Vocabulary in 1800.”<sup>55</sup>

In the early years of the Battle of the Atlantic, escort group commanders put this tactical doctrine into practice. However, the quality of the doctrines and the extent of their dissemination were not consistent; there was a spectrum from the incomprehensible to the innovative.<sup>56</sup> One of the best examples of the latter, prior to the inception of WATU, was that of Captain Frederick Walker, RN. While in

command of the 36th Escort Group beginning in October 1941, he disseminated the 36th Escort Group Operational Instructions to a total of nine ships in his group. These instructions demonstrated fluency among the operational objectives, a tactical antisubmarine doctrine, and a command philosophy of devolved control.

1. The object of the Group while on escort duty is to ensure the safe and timely arrival of the convoy concerned. It is not possible, with the ships available, to dispose of the Group in such a way as to protect the convoy completely from enemy attacks—these must be accepted and doubtless some losses. The only practicable course of action is to ensure that any enemy craft, either surface or air, which attack are destroyed.
2. The particular aim of the Group therefore is to be taken as the destruction of any enemy which attacks the convoy. U-boats are the chief menace to our convoys. I cannot emphasise too strongly that a U-boat sighted or otherwise detected is immediately to be attacked continuously without further orders, with guns, depth charges, and/or ram until she has been destroyed or until further orders are received.
3. I wish to impress on all officers that although I shall naturally take charge of the majority of operations, I consider it essential for themselves to act instantly without waiting for orders in situations of which I may be unaware or imperfectly informed.
4. It should seldom, if ever, be necessary to conclude a signalled report with the words: “Request instructions.” Action should be “proposed” or “intended” by the men on the spot—and the senior officer can always say if he doesn’t like it.
5. No officer will ever be blamed by me for getting on with the job in hand.<sup>57</sup>

Walker’s rendition of mission command orders and a statement of the commander’s intent, while a classic, was not enough on its own to solve the problem of countering the tactical doctrine the U-boats were applying, in particular their proclivity to attack at night and on the surface. However, the process of institutional learning was helped by the willingness of escort group commanders, such as Walker, to share operational experience with Roberts’s new organization. In addition Walker devised a tactical response that coordinated the reaction of escorts to a U-boat contact: “On the order ‘Buttercup’ by radio, all escorts would turn outward, increase to full speed, fire star shell for twenty minutes, and then return to station. Walker had in fact sunk two U-Boats by this tactic whilst escorting convoy HG 76 [home from Gibraltar].”<sup>58</sup>

### *Changing Course*

These contributions, while valuable, were still insufficient. The initial problem of the U-boats’ tactical operation was broken into two subquestions: From what range did the U-boats fire their torpedoes, and how did they approach a convoy?

Roberts challenged a key assumption escort commanders had been making: that the U-boats fired their torpedoes from outside the ring of naval escorts. In making this challenge, he relied on two pieces of empirical data. First, the range of a German torpedo was 5,400 yards (3.6 miles). Second, naval escorts operated up to five thousand yards (3.3 miles) out from a convoy.

Roberts made a new assumption that, to ensure a successful hit, the firing distance would be half the maximum range. This led to the second subquestion: If U-boats were attacking targets from within the convoy columns, how did they approach the convoy? There were four possibilities. (1) The U-boat dropped in from ahead on the surface, (2) it dived and surfaced in the middle of the convoy, (3) it pushed in from the convoy's flanks, (4) it infiltrated a convoy from astern.

The last option was, as far as U-boat commanders were concerned, the safest approach, and Roberts concluded that it was the most likely. Submerged, a U-boat could attain a speed of twelve knots, compared with a convoy speed of seven knots; thus the speed of infiltration from astern was five knots. Having successfully infiltrated from astern, the U-boat could fire its torpedoes on the surface from inside the convoy. This dovetailed with the operational experience of commanders such as Captain Walker. "The U-Boat was astern of the convoy, steering the same course, and the time was after midnight. Walker's 'stock' turning outward after a torpedoing and firing star shell out had caught and killed *another* U-Boat, not the culprit of the attack but an infiltrator coming to join the fray."<sup>59</sup> Walker's "'turn out' doctrine" provided the departure point for new assumptions on the basis of which tactical doctrine would be constructed.

The process that yielded the correct answer to the question of the position from which the U-boats attacked represented a critical questioning of established norms; WATU had identified the fallacious nature of the existing assumptions. This demonstrated a willingness to question the beliefs of even experienced escort commanders such as Walker. "This [was] against all our ideas[;] Walker's escorts imagined that the U-boat must be a mile or so *outside* the perimeter of the convoy ships."<sup>60</sup>

Roberts's staff consisted mostly of WRNS officers and ratings, who demonstrated these new ideas on the recently constructed tactical floor to Admiral Noble.<sup>61</sup> To his credit, Noble did not hesitate in communicating to the prime minister when doctrinal errors had been identified. "When Admiral Sir Percy Noble was briefed by Roberts on his analysis he frankly admitted the error of the existing anti-U-boat doctrine. He had a message sent to Churchill saying, 'the first investigations showed a cardinal error in anti-U-boat tactics, and that a new, immediate and corrected counter-attack would be signalled to the Fleet in 24 hours.'<sup>62</sup>

### *WATU: Putting Doctrine into Practice*

The next challenge was to facilitate adoption of the doctrine and counter the tactics German U-boats used to attack convoys—infiltrating convoys from astern. The new knowledge was integrated into a doctrinal solution. “On a torpedoing within the convoy, on one word of command, the escorts, all except the one leading the convoy, would turn at full speed and line up abreast at the rear of the convoy, a couple of miles astern, and begin an Asdic sweep. The escorts’ speed would be reduced to that of the convoy and, like a giant ‘trawl’ behind a fishing vessel, ‘sweep’ everything in front into the ‘trawl’ and they would have the U-boat.”<sup>63</sup> This tactical doctrine was called a “raspberry” and was the first of multiple “fruit” doctrines that WATU eventually formulated and disseminated.<sup>64</sup>

The new doctrine can be understood best through the prism of double-loop learning because it led to questioning the Royal Navy’s assumptions about how best to protect convoys from the disruptive technology of German submarines. Another way to understand the new doctrine is to see it as a manifestation of the quadrants of fighting power (new assumptions about tactics, changes in weapons technology and applications, developments in doctrine, and new command philosophy), which were being integrated owing to WATU’s actions.

The Admiralty—a hierarchical and centrally controlled bureaucratic organization—now had, in WATU, an institution that could start to resolve the learning paradox and collect and integrate knowledge from diverse sources to formulate and disseminate a tactical doctrine that would be operationally effective. “The doctrine in the ‘Atlantic Convoy Instructions’ was synthesized by Roberts from reports of proceedings, direct feedback from escort group commanders, tactical games at WATU, and investigations by unit staff. The advantage over the ad hoc individualistic training provided by some group commanders was that WATU could both analyse and fuse the experiences and lessons of many convoy operations.”<sup>65</sup>

Atlantic Convoy Instructions, issued under the authority of the Admiralty, had two variants: North and South Atlantic. The resultant instructions formed the doctrinal riposte to the U-boat threat, and they brought operational direction together with tactical instruction. They began with general reminders. “The safe and timely arrival of the convoy at its destination is the primary object of the escort. Evasion attains the primary object and should therefore be the first course of action considered. At the same time, it must be borne in mind that if enemy forces are reported or encountered, the escort shares with all other fighting units the duty of destroying enemy ships.”<sup>66</sup>

This was fused with a devolved command philosophy. “The senior officer of the escort group is in the best position to judge the most suitable disposition for the escorts and the correct action to take in various circumstances.”<sup>67</sup> The

application of the new doctrine was left to the discretion of senior commanders at sea. “Senior Officers of Escort Groups have complete freedom to exercise their initiative under all circumstances, and it is not desired that they should be rigidly bound to comply with any of the diagrams of operations orders laid down in ACIs [Atlantic Convoy Instructions].”<sup>68</sup>

The doctrines that WATU formulated and disseminated were first applied in engagements against U-boats in 1942. Convoy SC104 provides a good illustration of the doctrines’ tactical impact. It sailed from New York on October 3, 1942, and was under attack from October 11 onward. Between 10:15 PM on October 13 and 2:30 AM on October 14, six ships in this convoy were torpedoed. The response was in keeping with the tactical doctrine WATU had disseminated and was guided by the new, correct understanding of the direction of U-boat attack: “As all the escorts had now returned, operation ‘Raspberry’ was carried out, and at 0318 HMS *Fame* obtained an asdic contact four miles astern of the Convoy. After an attack with a five charge pattern the U-boat surfaced and escaped downwind; *Fame* was unable to catch up due to the rough weather.”<sup>69</sup>

The naval escorts of SC104 continued to be successful in applying this tactical doctrine in subsequent attacks. “At 1407/16 *Fame*, about two miles ahead of the fourth column, scored a notable asdic success, her first pattern, fired on a contact obtained at 2,000 yds, brought the U-Boat to the surface. *Fame* opened fire and went into ram. U353 was struck a glancing blow and a further pattern was dropped when it was abreast the stern. The crew hastily abandoned ship and the U-Boat then sank.”<sup>70</sup> This report needs to be seen in the context of 120 merchant ship sinkings during that month, and a total of 1,322 for the year. However, this month saw the beginning of a downward trend: by December, losses had fallen to seventy-six; by October 1943, thirty-one.<sup>71</sup>

WATU also disseminated a tactical doctrine detailing how a naval escort should respond on sighting a torpedo track.

1. RUN UP TRACK, sweeping by ASDIC.
2. Hoist warning signal. At night if “Snowflake” illumination by the convoy will assist the sighting ship to locate the U-Boat without endangering the convoy, fire two white rockets.
3. REPORT BY R/T [radio transmitter] to escorts and aircraft.
4. Allow adjacent ships to catch up so as to increase the efficiency of the asdic sweep.<sup>72</sup>

These doctrines constituted part of what was referred to as Western Approaches Tactical Policy. They encapsulated correct assumptions about U-boat tactics, the application of weapons technology, new doctrines, and the adoption of an appropriate command philosophy—the four quadrants of fighting power. It

had taken the Admiralty two years and four months since the start of the war to establish WATU, but now the unit was an integral part of the command structure, and yet was showing itself to be decentralized enough to respond quickly to the changing characteristics of the campaign in the North Atlantic.

The Instructions provided a common doctrine, so that escorts could be told what to do in a given situation quickly and concisely. Roberts did not try to impose a doctrinaire approach on tactics. On the contrary, captains and escort group commanders were encouraged to experiment with their own tactical schemes. Hence while there were standard instructions, their application remained elastic. Roberts insisted that group commanders show initiative and, at all times, display tactical aggression.<sup>73</sup>

WATU endeavored to ensure that the Atlantic Convoy Instructions never became a rigid template applied irrespective of changes in the character of the campaign. The instructions were improved and updated continually. There also was a recognition that maintaining operational tempo meant managing information efficiently, including disseminating new tactics quickly. As a practical matter, in a predigital age, this meant that "Howard-Johnston [ASW staff officer in Derby House] was dispatched to the printers so that there would be no delay in applying the new tactics to the Western Approaches Convoy Instructions!"<sup>74</sup>

### *Teaching the Doctrine*

As seen through the prism of double-loop learning, one of the most important functions WATU performed was applying its decentralized structure to the teaching of these new norms, policies, and objectives, once Roberts's staff had developed them. Systematic dissemination of doctrine was best ensured by teaching it. Between 1942 and 1945, WATU took doctrine back to its etymological roots.<sup>75</sup> The course was not intended to ensure that a number of tasks could be performed on a repetitive basis; instead, the teaching was nuanced, and doctrine was interpreted as being authoritative but requiring judgment in its application. The integrated knowledge that WATU had accumulated enhanced operational effectiveness. The instruction also was interservice, in terms of its cohort: personnel from not only the Royal Navy but the Coastal Command of the Royal Air Force attended courses run at WATU.<sup>76</sup> The aim was to ensure that this tactical doctrine facilitated application of one of the most important principles of war: unity of effort.

This raises three questions that need to be addressed to understand and appreciate the effectiveness of this institutional learning: What was the content of these courses? How were they managed? And who attended them? The content of the courses consisted of four distinct modules.<sup>77</sup> Its four modules covered a diverse set of topics in a short period, while ensuring that a singular objective was met and each course lasted one week. Roberts's annual report of December

1944 provides an insight to the number of courses that had been conducted up to that date and how his staff managed the teaching challenge at WATU. "A total of 132 courses have passed through W.A.T.U. in line ahead at one day interval between each. If, during three years work, standard game and lecture routine had been adopted, the Staff would long ago have become tired and stale. . . . [I]t is of paramount importance to show the course officers that the Staff is always enthusiastic, in order to transmit enthusiasm and zest."<sup>78</sup>

The numbers and ranks of the officers who attended the course reflected both hierarchical structure and operational need. RN attendees' ranks ranged from admiral (one student) to warrant officer (six students); the most numerous rank was lieutenant (479 students). Roberts ensured that WATU's ASW tactical doctrine was disseminated widely throughout the officer corps of the Royal Navy, writ large. "No Admiralty appointment has ever been denied to even an R.N.V.R. Sub-Lieutenant from doing the full U-boat course."<sup>79</sup> Apart from officers from the naval reserves and Commonwealth navies, there also were officers from six foreign navies.<sup>80</sup> As noted, WATU was part of a joint command, and 118 RAF personnel attended the one-week course. These attendees' ranks ranged from air commodore (two students) to flight sergeant (five students). Four civilian professors also attended.<sup>81</sup> In all, between early 1942 and late 1944, 3,585 officers attended courses run by WATU. "The peak of this period was reached in early 1944 when each weekly course contained an average of 40 officers. The average at the end of 1944 had dropped to just 30, which average is maintained by requirements, space, and staff available. This averages 1,500 officers per annum."<sup>82</sup>

### *Doctrinal Integration*

By early 1943, WATU again had proved responsive and adaptive by integrating the new technology of the escort carrier into ASW doctrine. Although each carrier could operate only six or seven aircraft, it could maintain a continuous combat air patrol over a convoy and directly addressed what had become known as the "air gap." This was an area in the middle of the Atlantic that could not be covered by shore-based Allied patrol aircraft. The escort carrier did much to complement the very-long-range B-24 Liberators based in Northern Ireland, Iceland, and Halifax. On February 11, 1943, Commander in Chief, Western Approaches sent a memorandum classified "Most Secret" to the secretary of the Admiralty. It confirmed that the process of integration had been completed successfully. "After experience had been gained in the operation of Escort Carriers, a new Article 145 will be incorporated in A.C.I.s."<sup>83</sup> The new Instructions for the Operation of Escort Carriers, issued on February 7, 1943, took care to settle the issue of command within the existing command philosophy framework. "Command at sea is to be exercised in accordance with A.C.I. Article 16. With reference to paragraph

3 of Article 16, an Escort Carrier is NOT to be considered as forming part of the A/S Escort.”<sup>84</sup> Thus, a new weapon was integrated doctrinally without compromising the existing command arrangements, as the commanding officer of an escort carrier could not command other escort ships.

WATU replicated its activities within the North Atlantic theater and beyond it. By the end of 1942, a second tactical unit was operating in Londonderry. When Roberts submitted his annual report for the end of 1944, three more tactical units had been established in Belfast, Northern Ireland, and in Irwell and Osprey in Scotland. Tactical units also had been established in Bombay, Sierra Leone, and Halifax. Roberts summed up the relationship between WATU and these outstations as follows: “Tactical Units have been installed in the Empire which are not under my charge, but are ‘in touch.’”<sup>85</sup> This further illustrates that WATU enabled the Royal Navy to replicate a learning organization that successfully could challenge existing norms, objectives, and policies pertaining to trade defense even when applied to geographically diverse theaters of operation.

The preparation for the D-day landings in Normandy provides another good example of WATU undertaking new doctrinal tasks. From mid-March to mid-May 1944, a number of special courses were held concurrently with the existing courses; the Admiralty appointed extra staff members to cope with the situation. “These special courses were in anti-E-boat (and anti-W-boat) warfare, and a total of 372 officers took part in the preparations for OVERLORD. During this period there was close liaison between W.A.T.U. and the port operational authorities concerned.”<sup>86</sup> The value of this adaptive flexibility was recognized in a memo from the Commander in Chief, Western Approaches to the secretary of the Admiralty dated December 20, 1944. “The special tactical training given for Operation OVERLORD is deserving of the highest praise.”<sup>87</sup>

As emphasized previously, the operational objective of the naval escorts was to ensure the safe and timely arrival of the convoys. Tactically, the most effective way to achieve this was to avoid the U-boat wolf packs completely. This could be achieved by rerouting convoys past the enemy’s patrol lines. By August 1942, WATU had formulated and disseminated an additional tactical doctrine. This underlines the point that enemy practice often leads to the formulation of new doctrine. In this case, the objective was to enable naval escorts to react effectively to a shadowing U-boat, yet still enable a convoy to execute an alteration of course and thereby avoid an attack.

U-boats will sometimes remain shadowing for several days[,] reporting from time to time on H/F. If other U-boats are ordered to close the convoy to make a “Pack” attack the shadowing U-boat will, in the later stages, before attack, make signals on M/F. On receipt of a bearing of an M/F homing signal it should always be assumed that the convoy is concerned and an immediate search should be along the bearing obtained.

Should a U-boat be sighted, an escort should be left in the area to keep it down until dark, even if asdic contact is not gained, so as to cover a large alteration of course by the convoy.<sup>88</sup>

By early 1943, rerouting tactics had reached their limits. “Dönitz’s strategy, driven by the amount of tonnage sunk per U-boat day at sea, had forced him to concentrate his effort in the mid-ocean air gap so that by early 1943 it was literally filling up with submarines.”<sup>89</sup> This area presented the increasingly large and numerous wolf packs with many opportunities. Again, such a change on the enemy’s part required that the defenders adjust; in this case, they needed to engage and sink U-boats in and around the convoy, as stated in the ACIs: “[T]he close escort of a convoy was the *last* line of defence, and it fought if all else failed.”<sup>90</sup>

Yet by May 1943, Germany’s wolf-pack doctrine was facing severe challenge. During this month there were a series of battles around convoys. Naval escorts inflicted losses that were not sustainable. By late 1943, German staff records reveal the multifaceted challenges that new weapons technology and doctrine were presenting. “The U-boats had been seriously impeded by air and sea escorts of unprecedented strength and, in the nocturnal melee, had failed to gain bearing through having to take avoiding action against air and surface radar, diving because of the approach of aircraft or destroyers, fighting off aircraft.”<sup>91</sup> The teaching at WATU had enabled the dissemination and application of an effective ASW tactical doctrine that included the use of weapons technology that forced a suboptimal German response.

WATU had no equal in the German navy. After the German surrender in May 1945, Captain Roberts had the opportunity to interrogate Rear Admiral Godt, operational commander of the U-boat arm. Roberts recounted,

I could not resist asking Godt if there was any form of Tactical Table [the exercise floor at Western Approaches Command, located in Derby House, Liverpool], similar to W.A.T.U. in his service. He replied that there was not, but in 1944 he had seen the “Illustrated” and had caused the article and the photographs of W.A.T.U. to be commented upon by his Staff. He admitted the value of such an Establishment, but he did not consider adapting it to his needs as it was firstly “too late in the war” and secondly he relied more on the sea training with the Tactical Flotilla.<sup>92</sup>

The article set out to discover the impact of organizational learning and the entity that implemented it during World War II. First, can a theory of organizational learning explain the improved effectiveness of one tactical organization during the Second World War—specifically, the development of antisubmarine tactical doctrine between 1942 and 1945—and illustrate the importance of acquiring new knowledge in an operational context like the Battle of the Atlantic? Second, to

what extent was WATU the product of a bureaucratic, centrally controlled, hierarchical Admiralty and how was it able to collect, transfer, and integrate knowledge to achieve three things: first, challenge existing norms, objectives, and policies that pertained to trade defense; second, facilitate adaptation of tactics and counter the tactics German U-boats used to attack convoys; and third, teach and disseminate doctrine to naval officers appointed to escorts in the North Atlantic and officers from the RAF's Coastal Command? Finally, was the learning paradox—the ability to imbue a naval hierarchy with adaptability and flexibility—resolved, and does WATU represent only a concrete, historically specific case, or are there lessons worth learning for other navies in the twenty-first century?

Double-loop learning provides a framework to understand how WATU created a learning climate that successfully challenged the assumptions about how naval escorts should react when a convoy was attacked. New norms, objectives, and policies were developed. Most importantly, it spurred pursuit of an answer to the critical tactical problem: How and from what range did the U-boats attack a convoy? Learning the correct answer to this problem brought about a complete re-writing of the Royal Navy's ASW tactical doctrine—in particular, what the escorts should do when a U-boat attack began. By late 1942 and early 1943, new weapons systems embedded in a tactical doctrine framework meant that the Admiralty could both protect convoys from U-boat attacks and at the same time turn the area around the convoys into a killing ground. The learning paradox was resolved.

In this process, the four quadrants of fighting power can be discerned: the correction of assumptions about how the conflict was being fought, changes in weapons technology, development of new doctrine, and adoption of an appropriate command philosophy. All four helped WATU to enhance its tactical and operational effectiveness. The Royal Navy, thanks in part to the inception of WATU, overcame one of the most important challenges that any organization faces in a crisis: the proclivity to produce a dysfunctional response to sustained threats and problems. "Individuals and organizations tend to deal with threat in ways that will increase defensiveness and reduce the probability of learning to learn."<sup>93</sup> The German report previously cited reveals the Royal Navy's initial approach to the ASW challenge near the North Channel in late 1940 to have been just such a dysfunctional response.

Pivotal to the Allied victory in the Battle of the Atlantic was the neutralization of the disruptive U-boat technology. This was achieved in part through the embedding of new and improved weapons systems, ranging from 10 cm radar to escort carriers, into a doctrinal framework. The effectiveness of these new "hard" weapons technologies was enhanced by a synthesis of the "soft" weapons of signals intelligence and doctrine. The integration of these diverse elements produced a force-multiplier effect that from late 1942 increased the tempo and

effectiveness of ASW tactical operations and enabled defeat of the U-boats at the operational level in the North Atlantic theater.

Finally, what lessons can twenty-first-century navies learn from the case study presented here? First, this historically specific case shows that a well-formulated, disseminated, and consistently applied doctrine can be a force multiplier.

Second, the strategic importance of certain geographical locations are not permanently discounted by changes in transport or weapons technology. Furthermore, human agency has its limitations. The disruptive technology of the submarine meant that the Irish naval bases that covered the Western Approaches were just as important for the formation and routing of convoys in the Second World War as they had been in the First World War—the caveat being that in the former war the Royal Navy did not have access to them because of the geostrategic blindness of British policy makers in the late 1930s.

Finally, poor geostrategic decision-making can be redeemed by alternative choices that offset the loss of operational efficiency and effect. In March 1941, although their country was still technically neutral and referring to itself as an associated power, U.S. military planners with presidential endorsement made the decision, in secret, to begin the construction of two naval bases in Northern Ireland. This was done on the basis of the recognition that the threat to sea communications of the United Kingdom was a key risk that had to be addressed by the United States and the geostrategic center of gravity was the northwest approaches.

Navies of the twenty-first century can take away a number of other pertinent lessons. For a navy to learn there has to be an institutional appreciation that a discrepancy exists between an action taken and the result—in short, there are often unexpected consequences. Inquiry and reflection should result in corrective action, which then should become “embedded in organizational memory . . . and in organizational routines and procedures.”<sup>94</sup> A doctrine that simply encapsulates required routines and procedures is not enough; the command philosophy has to meet the circumstances as well. General Sir Rupert Smith has identified the dynamic relationship between doctrine and command philosophy. “If doctrine is the epoxy the commander’s way of command in the circumstances is the hardener.”<sup>95</sup> The success of this combination will depend on a receptive attitude within an officer corps and how such receptiveness can be engendered. Furthermore, there is still a need for navies to teach doctrine. The learning outcome can be a force multiplier that can give a competitive edge when forces are evenly matched or outnumbered.

This learning outcome is illustrated by one of the critical stages of the Battle of the Atlantic: “Through January and February [1943] Ultra provided the information, but the Germans were reading the Allies’ daily estimates of U-boat positions and anticipated their movements. The battle for ONS 166 in late February, in

which 14 ships were lost in a six-day battle with 18 U-boats, was fought with both shore staffs reading the other side's signal traffic."<sup>96</sup> A theory of organizational learning helps to explain how the Royal Navy, through the teaching of doctrine, improved tactical effectiveness of its naval escorts. The institution created to formulate and disseminate doctrine, WATU, proved adept at challenging existing norms, objectives, and policies. This example underscores the claim made about doctrine by Julian Corbett; it is "the soul of warfare."<sup>97</sup>

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## NOTES

1. Chiefs of Staff, memorandum, "Necessity for Base Facilities in Eire," March 8, 1941, Prime Minister's Office files [PREM] 3/127/2, The National Archives, Kew, U.K. [hereafter TNA]; Memorandum Dealing with the Entry, Training, and Employment of Officers and Men of the Royal Navy and of the Royal Marines, 1902, Cd. 1385, p. 3.
2. See Memorandum Dealing with the Entry, Training, and Employment of Officers and Men of the Royal Navy and of the Royal Marines.
3. Max Visser, "Learning under Conditions of Hierarchy and Discipline: The Case of the German Army, 1939–1940," *Learning Inquiry* 2, no. 2 (August 2008), pp. 127–37.
4. Examples of this extensive literature are Andrew J. Bacevich, *The New American Militarism: How Americans Are Seduced by War* (New York: Oxford Univ. Press, 2005); Williamson Murray and Allan R. Millett, eds., *Military Innovation in the Interwar Period* (Cambridge, U.K.: Cambridge Univ. Press, 1996); James S. Corum, *The Luftwaffe: Creating the Operational Air War, 1918–1940* (Lawrence: Univ. Press of Kansas, 1997); James S. Corum, *The Roots of Blitzkrieg: Hans von Seeckt and German Military Reform* (Lawrence: Univ. Press of Kansas, 1992); MacGregor Knox and Williamson Murray, eds., *The Dynamics of Military Revolution 1300–2050* (Cambridge, U.K.: Cambridge Univ. Press, 2001); Daniel Ford, *A Vision So Noble: John Boyd, the OODA Loop and America's War on Terror* (Durham, NH: Warbird Books, 2013); Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany between the World Wars* (Ithaca, NY: Cornell Univ. Press, 1984); Chad C. Serena, *A Revolution in Military Adaptation: The US Army in the Iraq War* (Washington, DC: Georgetown Univ. Press, 2011); and Adam Grissom, "The Future of Military Innovation Studies," *Journal of Strategic Studies* 29, no. 5 (2006), pp. 905–34.
5. Eliot A. Cohen and John Gooch, *Military Misfortunes: The Anatomy of Failure in War* (New York: Free Press, 1990), p. 26.
6. Murray and Millett, *Military Innovation in the Interwar Period*, pp. 367–68.
7. See Robert Foley, "Dumb Donkeys or Cunning Foxes? Learning in the British Armies and German Armies during the Great War," *International Affairs* 40 (2014), pp. 279–98, and Sergio Catignani, "'Getting COIN' at the Tactical Level in Afghanistan: Reassessing Counter-insurgency Adaptation in the British Army," *Journal of Strategic Studies* 35, no. 4 (2012), pp. 513–39.
8. Aimée Fox-Godden's book, *Learning to Fight Military: Innovation and Change in the British Army, 1914–1918* (Cambridge, U.K.: Cambridge Univ. Press, 2018), represents a significant contribution to organizational learning. See also Aimée Fox-Godden, "Beyond the Western Front: The Practice of Inter-theatre Learning in the British Army during the First World War," *War in History* 23, no. 2 (March 2016), p. 193.
9. Cohen and Gooch, *Military Misfortunes*, p. 76.
10. See Carla O'Dell and C. Jackson Grayson, "If Only We Knew What We Know: Identification and Transfer of Internal Best Practices," *California Management Review* 40, no. 3 (Spring 1998), pp. 154–74.

11. Matthew Ford, "Learning the Right Lessons: Military Transformation in Crisis and the Future of Britain's Armed Forces," epilogue to *A Military Transformed? Adaptation and Innovation in the British Military, 1792–1945*, ed. Michael LoCicero, Ross Mahoney, and Stuart Mitchell (Solihull, U.K.: Helion, 2014), p. 250.
12. Silvia Gherardi, "Learning as Problem-Driven or Learning in the Face of Mystery?," *Organization Studies* 20, no. 1 (1999), p. 99.
13. Ibid., p. 128; Wesley M. Cohen and Daniel A. Levinthal, "Absorptive Capacity: A New Perspective on Learning and Innovation," *Administrative Science Quarterly* 35, no. 1 (March 1990), pp. 128–52.
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15. Ibid., p. 3.
16. Chris Argyris, *On Organizational Learning* (Malden, MA: Blackwell, 1992), p. 159.
17. See, for example, Murray and Millett, *Military Innovation in the Interwar Period*; Corum, *The Luftwaffe*; and Knox and Murray, *The Dynamics of Military Revolution 1300–2050*.
18. Knox and Murray, *The Dynamics of Military Revolution 1300–2050*, p. 158.
19. Argyris, *On Organizational Learning*, p. 9.
20. For accounts of the campaign as a whole see Peter Padfield, *War beneath the Sea: Submarine Conflict during World War II* (New York: Wiley, 1998); David Syrett, *The Defeat of the German U-boats: The Battle of the Atlantic* (Columbia: Univ. of South Carolina Press, 1994); Clay Blair, *Hitler's U-boat War*, vol. 1, *The Hunters, 1939–1942* (New York: Random House, 1996); and Dan van der Vat, *The Atlantic Campaign: The Great Struggle at Sea 1939–45* (Edinburgh: Birlinn, 2001).
21. They also had represented a disruptive technology in the First World War, but the lessons had been ignored in the interwar period. See Steve R. Dunn, *Bayly's War: The Battle for the Western Approaches in the First World War* (Barnsley, U.K.: Seaforth Publishing, 2018).
22. Admiral Beatty and Churchill had negotiated this agreement with Michael Collins and Erskine Childers in October 1921. Beatty had argued that "naval requirements were demonstrated in the last war. We could not fight a naval war unless we controlled the Irish coast. Numerous vessels could recoup in its numerous inlets." Even Michael Collins appreciated the fact that the ability of the Royal Navy to enforce sea control and sea denial was critical to protecting Irish neutrality: "When the British Navy is beaten, the neutrality of Ireland does not matter a damn." Conference on Ireland, Naval Defence, October 13, 1921, F/25/2/32, Lloyd George Papers, House of Lords Library, London.
23. This last base was by far the most important and was protected by three forts at the entrance to Cork Harbour.
24. See 335 Parl. Deb. H.C. (5th ser.) (1938) cols. 1100–101.
25. From its secession in 1922 to 1937, the south of Ireland was known as the Irish Free State. With a new constitution in 1937, its name was changed to Eire.
26. Lord Chatfield, *It Might Happen Again*, vol. 2, *The Navy and Defence* (London: Heinemann, 1947), p. 127.
27. Capt. S. W. Roskill, letter to the editor, *The Times* (London), January 7, 1970.
28. John H. Maurer, "The Struggle for Sea Power: Lessons from the Great War," *Orbis* 62, no. 2 (2018), p. 189.
29. This was the headquarters of the Royal Navy's Western Approaches Command.
30. For a detailed analysis of Ireland's geopolitical and geostrategic importance during the Second World War, see Geoffrey R. Sloan, *The Geopolitics of Anglo-Irish Relations in the Twentieth Century* (London: Leicester Univ. Press, 1997), pp. 196–238.
31. See Karl Dönitz [Grand Adm., Imperial German Navy], *Memoirs: Ten Years and Twenty Days*, trans. R. H. Stevens (London: Weidenfeld and Nicolson, 1959), p. 102.
32. Bob Carruthers, *The U-boat War in the Atlantic*, vol. 1, *1939–1941* (Barnsley, U.K.: Pen & Sword Maritime, 2013), p. 113.
33. Commander-in-Chief, Atlantic Fleet, U.S. Naval Administration in World War II, vols. 2 and 3, 1946, pp. 12–13, U.S. Navy Operational Archives, Navy Yard, Washington, DC.
34. Halford J. Mackinder, "The Geographical Conditions of the Defence of the United

- Kingdom," *National Defence* (July 1909), p. 90.
35. Holger H. Herwig, "The Submarine Problem," in *Military Innovation in the Interwar Period*, ed. Murray and Millett, p. 243.
  36. Joseph A. Maiolo, "Deception and Intelligence Failure: Anglo-German Preparations for U-boat Warfare in the 1930s," *Journal of Strategic Studies* 22, no. 4 (1999), pp. 55–76.
  37. The First Lord of the Admiralty was the political head of the Royal Navy. This committee had been formed as a result of a letter sent by the secretary of the Admiralty to shipowners, the Board of Trade, the Corporation of Lloyd's, and representatives of the war risk underwriters associations on February 5, 1937.
  38. W. G. Constantine [Cdr., RD, RNR], "Convoy Operations: An Historical Appraisal," undated, author's personal collection.
  39. Asdic suffered from a short range, a lack of capability in inclement weather, and an inability to detect U-boats on the surface.
  40. Constantine, "Convoy Operations."
  41. Donald Macintyre [Capt., RN], *U-boat Killer: Fighting the U-boats in the Battle of the Atlantic* (London: Quality Book Club, 1956), pp. 16–17.
  42. Marc Milner, "The Battle of the Atlantic," in *Decisive Campaigns of the Second World War*, ed. John Gooch (London: Frank Cass, 1990), p. 47.
  43. Macintyre, *U-boat Killer*, p. 19.
  44. Terence Robertson, *Walker R.N.: One of the Great True Stories of World War Two* (London: White Lion Publishers, 1975), p. 36.
  45. Macintyre, *U-boat Killer*, p. 19.
  46. It was called Protection of Shipping at Sea (C.B 01764[39]).
  47. Constantine, "Convoy Operations."
  48. I am grateful to Rear Adm. Christopher Parry, RN (Ret.), for this insight.
  49. Malcolm Llewellyn-Jones, "The Pursuit of Realism," in *The Face of Naval Battle: The Human Experience of Modern War at Sea*, ed. John Reeve and David Stevens (Crows Nest, NSW, Austral.: Allen and Unwin, 2003), p. 221.
  50. Dudley W. Knox [Lt. Cdr., USN], "The Role of Doctrine in Naval Warfare," U.S. Naval Institute *Proceedings* 41/2/156 (March–April 1915), p. 347.
  51. Mark Williams, *Captain Gilbert Roberts R.N. and the Anti-U-boat School* (London: Cassell, 1979), p. 85.
  52. Bletchley Park was the home of the British government's code and cipher school.
  53. Carlo D'este, *Warlord: A Life of Churchill at War, 1874–1945* (New York: HarperCollins, 2008), p. 651. The new variation was the introduction of four rotors instead of three on the German navy Enigma machines.
  54. Williams, *Captain Gilbert Roberts R.N. and the Anti-U-boat School*, p. 87.
  55. J. H. S. McAnally [RAdm., RN], "The Purpose and Benefits of Doctrine: Why Go to All the Trouble of Having One?," in *Doctrine and Military Effectiveness*, ed. Michael Duffy, Theo Farrell, and Geoffrey Sloan (Exeter, U.K.: Univ. of Exeter Press, 1997), p. 9.
  56. Commander Howard-Johnston, an escort commander, and an antisubmarine specialist since 1931, issued his own operational instructions that were so complicated that most of his group could not understand them. Llewellyn-Jones, "The Pursuit of Realism," p. 220.
  57. Robertson, *Walker R.N.*, pp. 37–38.
  58. Williams, *Captain Gilbert Roberts R.N. and the Anti-U-boat School*, p. 87.
  59. Discussion taken from *ibid.*, p. 92.
  60. "The Life and Letters of Gilbert Harland Roberts" (unpublished manuscript), quoted in W. Glover, "Manning, Training the Allied Navies," in *The Battle of the Atlantic, 1939–1945: The 50th Anniversary International Naval Conference*, ed. Stephen Howarth and Derek Law (Annapolis, MD: Naval Institute Press, 1994), p. 202.
  61. WRNS refers to the Women's Royal Naval Service formed in 1917 and known as the Wrens in the Royal Navy. The tactical floor they used consisted of canvas, string, and chalk!
  62. Glover, "Manning, Training the Allied Navies," p. 202.
  63. Williams, *Captain Gilbert Roberts R.N. and the Anti-U-boat School*, p. 93.

64. The name was coined by 3rd Officer Jean Laidlaw, WRNS: "She had named it as a 'Raspberry to Hitler,' a common noise and gesture of the time." *Ibid.*, p. 95.
65. Llewellyn-Jones, "The Pursuit of Realism," p. 221.
66. South Atlantic Convoy Instructions, January 1942, Admiralty Papers [hereafter ADM] 1/12137, TNA.
67. *Ibid.*
68. Quoted in Malcolm Llewellyn-Jones, *The Royal Navy and Anti-submarine Warfare, 1917–49* (London: Routledge, 2006), p. 44.
69. Analysis of U-boat Operations in the Vicinity of Convoy, S.C.104, October 11–16, 1942, p. 2, ADM 199/2011, TNA.
70. *Ibid.*, p. 3.
71. See C. B. A. Behrens, *Merchant Shipping and the Demands of War* (London: Her Majesty's Stationery Office, 1955).
72. South Atlantic Convoy Instructions, p. 301—On Sighting a Torpedo Track, 1942, ADM 1/12137, TNA.
73. Llewellyn-Jones, "The Pursuit of Realism," pp. 221–22.
74. Williams, *Captain Gilbert Roberts R.N. and the Anti-U-boat School*, p. 95.
75. The word originally comes from the Latin word *doctrina*, meaning to teach.
76. It is important to remember that Liverpool was a combined area headquarters as well.
77. This comprised anti-U-boat operations in coastal exclusion areas; anti-U-boat operations in midocean, including Type XXI U-boats; surface tactics; and U-boat packs, including Type XXI U-boats.
78. Western Approaches Tactical Unit, Annual Report—December 1944, ADM 1/17557, TNA.
79. *Ibid.*
80. These navies were as follows: Royal Netherlands Navy, Royal Norwegian Navy, Royal Hellenic Navy, Polish Navy, Free French Navy, and the United States Navy.
81. Although there is no primary-source evidence for this, it is probable that one of the professors who attended the WATU course was Patrick Blackett, who was then head of the Admiralty Research Division.
82. Western Approaches Tactical Unit, Annual Report—December 1944.
83. Convoys and Escorts (27): Escort Carriers: Instructions for Operation with Convoys Amendment to Atlantic Convoy Instructions, ADM 1/13081, TNA.
84. *Ibid.*
85. Western Approaches Tactical Unit, Annual Report—December 1944.
86. *Ibid.*
87. Commander-in-Chief, Western Approaches to the Secretary of the Admiralty, memo, December 20, 1944, ADM 1/17557, TNA.
88. South Atlantic Convoy Instructions, pt. 306, August 22, 1942, ADM 1/12137, TNA.
89. Milner, "The Battle of the Atlantic," p. 57.
90. *Ibid.*, p. 47.
91. Bob Carruthers, *The U-boat War in the Atlantic*, vol. 3, 1944–1945 (Barnsley, U.K.: Pen & Sword Maritime, 2013), p. 97.
92. Report from Captain Roberts, RN on Visit to Germany May 1945 to Interrogate German Naval Officers on U-boat Operations, Appendix II, ADM 1/17561, TNA.
93. Argyris, *On Organizational Learning*, p. 159.
94. *Ibid.*, p. 129.
95. Communication from Gen. Sir Rupert Smith to the author, March 11, 2008.
96. Milner, "The Battle of the Atlantic," p. 58.
97. Julian Stafford Corbett, *Naval and Military Essays* (Cambridge, U.K.: Cambridge Univ. Press, 1914), p. 24.