

Wargaming the Atlantic War: *Captain Gilbert Roberts and the Wrens of the Western* *Approaches Tactical Unit*

by Paul Edward Strong



*The staff at the Western Approaches Tactical Unit - 22 January 1945.
Note the chalk marks, indicating key moves in the wargame, on the tactical floor
(Admiralty Official Collection IWM)*



Abstract

The Western Approaches Tactical Unit (WATU) was a Royal Navy analysis team founded in early 1942. Their remit was to study the conduct of convoy operations, to understand how the U-boats operated and to formulate tactics to counter this evolving threat. The unit was made up of experienced naval officers and a number of talented young women from the WRNS. Using conceptual/analytical wargames, WATU developed a range of tactics during the war and disseminated these to over 5,000 Allied officers through a series of lectures and tactical games. Many of these appeared in the Atlantic Convoy Instructions and were used with considerable success by Allied naval forces during the decisive engagements of the Atlantic War. The essay outlines the origins and purpose of the organisation, how the team functioned, the individuals that conducted the wargames, and the series of evolving challenges that it was intended to overcome – focusing on the series of Anti-Submarine Warfare training and analysis wargames conducted by the unit between 1942 and 1943. The article concludes with an overview of some of the numerous lessons that modern defence analysts could draw from the work of the unit and highlights its utility as an exemplar of the use of wargaming as a tool for modern defence analysis.

"The only thing that ever really frightened me during the war was the U-boat peril."

Winston Churchill

The Western Approaches Tactical Unit was a dedicated training and analysis team created in January 1942 and tasked to improve the development and dissemination of new tactics to Royal Navy and Allied vessels escorting convoys across the Atlantic. Using innovative analytical methods, WATU developed a range of tactics during the war and disseminated these to over 5,000 officers through a series of lectures and tactical wargames. Many of these appeared in the Atlantic Convoy Instructions and were used with considerable success by the Royal Navy, the Royal Canadian Navy, the United States Navy and other Allied naval forces during the decisive engagements of the Atlantic War.

Keeping supplies flowing across the Atlantic to the UK (and transporting a proportion onwards to Russia) was vital to Allied strategy during the Second World War¹. Reminiscing after the war ended, Churchill noted "never for one moment could we forget that everything happening elsewhere, at sea or in the air, depended ultimately on (the) outcome (of the Atlantic War)"². During the inter-war period, the Royal Navy had been confident that they could deal with almost any conceivable scenario involving a submarine threat. The tactics and technologies developed in the First World War (particularly convoy and the sonar technology known as ASDIC) were still deemed to have utility³, the German U-boat fleet was relatively small, and the few ocean-capable boats that the Kriegsmarine possessed were assumed to have to transit the Dover Strait or the North Sea to reach Britain's shipping lanes. However, the Fall of France in 1940 transformed the strategic situation, giving the Germans access to bases on the French Atlantic coast. As the war unfolded, increased production increased the number of operational boats and eight U-boat flotillas were eventually deployed to French bases - Brest (1st and 9th), Lorient (2nd and 10th), Saint Nazaire (7th and 6th), La Rochelle (3rd) and Bordeaux (12th)⁴. Understandably, the British increased the number of convoy escorts to protect their shipping.

¹ This essay is an expanded version of the short article that appeared in Issue 16 of the Women in War Group newsletter. The inspiration for this article came from Mark Williams, *Captain Gilbert Roberts RN and the Anti-U-boat School*, Cassell (1979) - the subject was first suggested by Edward Butcher of the Royal Navy's Maritime Warfare Centre and kindly supported by Jenny Wraight, the Admiralty Librarian at the Royal Navy's Navy Historical Branch. For detail on the impact on UK trade of the U-boat campaign, see *The Battle of the Atlantic - 1939 - 1945, The 50th Anniversary International Naval Conference* (edited by Stephen Howarth and Derek Law), Greenhill (1994), Philip Pugh, Chapter 1, 'Military need and Civil Necessity' and Thomas Adams, Chapter 8, 'The Control of British Merchant Shipping'. The alternative title for the essay is 'Wargaming the Battle of the Atlantic'.

² Winston Churchill, *The Second World War*, Vol 5, (1951) P.6

³ Atlantic War Conference (1994), H. P. Willmott, Chapter 9 - 'The Organisations: The Admiralty and the Western Approaches', P180, Willmott notes that there was no attempt to analyse the lessons of the WWI ASW effort in the interwar period due to the expectation that the threat had been adequately countered. This delayed the re-introduction of convoys. William Glover - Chapter 10 - 'Manning and Training in the Allied Navies', P 189, notes that only 11 of 1,029 lieutenants and 16 of 972 lieutenant commanders specialised in ASW in 1935

⁴ Atlantic War Conference (1994), Willmott in Chapter 9 points out that any analytical scenario that suggested that France would have been rapidly overwhelmed would not have been deemed plausible in the interwar period

In a series of pre-war wargames, Befehlshaber der Unterseeboote (Commander of U-Boats) Karl Dönitz and his planners had tested the potential for evading the Royal Navy's ASDIC and hydrophone capabilities by attacking on the surface in a series of wargames and exercises. In the early years, radar was rudimentary and the few sets available were limited to shore facilities and the largest warships, so the escorts would have to depend on spotting potential attackers with the naked eye. In addition, the Ubootwaffe's analysts confirmed Dönitz's assumption during the Great War that a coordinated attack by several U-boats would be more effective than a single submarine taking on the entire escort group⁵. This was the origin of the dreaded wolf-pack, a term derived from Dönitz describing his captains as using *rudeltaktik* (wolf-pack tactics) to overwhelm a convoy's protection. Using these tactics, the available U-boats deployed in patrol lines across the Atlantic and then converged on a suitable target once it was spotted. Sometimes convoys were also spotted by a Focke-Wulf 200 (Condor) observation aircraft or identified from intelligence/signals analysis by the highly efficient B-Dienst (Beobachtungsdienst - observation service).

At this early stage in the war, attacks on the sparsely defended convoys were made at night and the U-boats attempted to coordinate their attacks so that the escorts would be overwhelmed. If spotted, the U-boat would accelerate and crash-dive - turning off their diesel engines when they submerged and relying on their batteries to make a series of silent turns so that their course and position were as unpredictable as possible. The hunting vessel's ASDIC operator sent out a series of sonar pings (the effective range was about 1,300 yards), attempting to use the distinctive reflected counter-ping to identify the target's approximate range and bearing. An 'instantaneous echo' indicating that the U-boat was directly ahead of the escort – thus presenting an opportunity to drop a pattern of potentially lethal depth charges. In the early years of the war, these would be rolled off the back of the escort with additional depth charges being fired from spigot mortars. These would then detonate at a pre-set depth some distance behind the vessel. Later variants had more powerful explosives and the stern-deployed pattern was supplemented by improved devices to increase the size and effectiveness of the spread. Depth charges do not have to directly hit a submarine; in addition to improved explosive propagation underwater, sub-surface explosions create pockets of air that implode and cause structural stresses, damaging the target or rupturing their hull. Veteran U-boat captains often listened for the splashes created by depth charges entering the water and would 'go deep' or order a quick burst of speed and drastically change their bearing, knowing that the sound of the escort's engines during the final approach and the pattern of detonations that followed would temporarily blind the escort's ASDIC system⁶.

⁵ Richard Doherty, *Churchill's greatest Fear: The Battle of the Atlantic, 3rd September 1939 to 7th May 1945*, Pen & Sword (2015), P.20

⁶ The Germans discovered that diving deeper would often put them beneath a thermal layer that would reduce the effectiveness of ASDIC. See also Peter Gretton, *Convoy Commander*, Corgi (1971), P.189, Gretton notes, after he had a chance to inspect U-boat command's records after the war, that the Germans use their hydrophones with great skill; both to monitor Allied escorts and to listen for distant convoys



Depth Charge detonating at the stern of HMS Starling (Wikimedia Commons)

As the numbers of U-boats increased, Dönitz eventually managed to gather large wolf-packs of up to forty submarines but he was rarely able to create decisive concentrations where they were most needed. The problem was that creating a wolf-pack required coordination and that created communications that the British could intercept and interpret. The British initially had considerable difficulty in breaking the more complex Kriegsmarine cyphers but, after getting access to U-110's codebooks and her Enigma machine in May 1941, the situation was transformed⁷. From this point onwards, U-boat communications were methodically collected by Y-Service's network of listening stations and then decrypted at Bletchley Park. This enabled Western Approaches Command to order convoys to evade the U-boat screen or concentrate escorts where they were most needed. The Kriegsmarine changed their codes more often than the Oberkommando des Heeres (army command) or the Luftwaffe so the code-breakers were often forced to work long hours to re-establish the flow of decrypted material. This process was hugely assisted by the flows of reports between the U-boats and the constant updates demanded by their HQ in Occupied France. The flow of communications also enabled high-frequency direction finding (HF/DF or Huff-Duff) which enabled the rough positions of U-boats to be triangulated, a process that got far easier once HF/DF sets were deployed on escorts. This information hugely assisted in the interception of surfaced U-boats by escorts or aircraft and was another method used by Western Approaches Command to re-route convoys so that they could evade the patrol lines⁸.

The first 'happy time' for the U-boats ended once Royal Navy and Royal Canadian Navy vessels could cover the entire trans-Atlantic route and once sufficient air power was finally diverted to hunting U-boats lurking in coastal waters. The veteran U-boat

⁷ Marc Milner, *The Battle of the Atlantic*, Tempus (2005), pp 61-62

⁸ Atlantic War Conference (1994), Jurgen Rohwer, Chapter 22 – 'The Wireless War' and Paul Kennedy, *Engineers of Victory: The Problem Solvers Who Turned the Tide in the Second World War*, Allen Lane (2013), Chapter 1

commanders inevitably shifted to picking off stragglers and concentrating their activities on the Mid-Atlantic Air Gap, where the convoys were out of range of Allied aircraft - a region known for poor weather and described by many escort captains as 'The Gap' or 'The Black Pit'. The obvious solution was to deploy carriers to cover this region but these were a scarce resource and the larger fleet carriers proved to be too juicy a target to risk in a convoy so numerous smaller and cheaper Merchant Aircraft Carriers, and subsequently escort carriers, were commissioned and these eventually did sterling service against the U-boats⁹. A typical convoy escort group would shepherd their charges in a strict rectangular formation, with the escorts deployed in a ring around the convoy conducting ASDIC/Radar sweeps. In the early years of the war there were very few escorts and some of these more suited to dealing with surface raiders - Convoy HX-84 initially set sail with only HMS Jervis Bay for company¹⁰! The escorts would be deployed to cover the most likely direction of threat, either identified by HF/DF or the escort group commander's intuition.

For example, in December 1941, HG-76 protected by Escort Group 36, commanded by Captain Frederick 'Johnny' Walker, set off for the UK. The convoy consisted of thirty-two merchant ships protected by seventeen escorts - including an escort carrier (HMS Audacity). Dönitz ordered ten U-boats to converge on the convoy. Even with the high proportion of escorts and Walker's impressively pro-active approach to convoy protection, the U-boats still managed to sink two merchant ships, an escort and Audacity. Five U-boats were lost during the attack, a testament to the effectiveness of airpower and Walker's aggressive tactics. Some of the escorts were equipped with early radar sets and the effectiveness of these primitive systems was undoubtedly increased by the relatively calm sea-state during the engagement. At this stage in the war, radar operators often found it difficult to pick out a U-boat's conning tower from the noise created by an uneven sea state¹¹.

Early 1942 saw an unexpected setback in the duel between the U-boats and the convoy escorts. The Japanese attack on Pearl Harbour had brought the United States into the war but most of her best ships were transferred to the Pacific and the US Navy in the Atlantic proved surprisingly ill-prepared for combat against Dönitz's veteran U-boat commanders. Part of the problem was that the renowned series of US Navy wargames conducted in the 1930s had tended to focus on a future surface conflict against either Japan or the United Kingdom. The situation was exacerbated by the lack of escorts available for Atlantic duties, the failure to impose a blackout on the East coast, and the USN's 1941 *Escort of Convoy Instructions* prioritising actively 'hunting' U-boats over the dull business of protecting convoys. The situation wasn't improved by Admiral Ernest King's notorious reluctance to listen to any advice offered by the Royal Navy¹².

⁹ The Fleet Carriers were used in the Mediterranean convoys where the threat from the Luftwaffe and Regia Aeronautica made combat air patrols essential

¹⁰ See https://en.wikipedia.org/wiki/List_of_Allied_convoy_codes_during_World_War_II for a comprehensive list of 300 convoy codes - each defining the start point or destination of the convoy

¹¹ Atlantic War Conference (1994), Jan Heitman, Chapter 27 - 'The Front Line: Convoy HG76 - The Offense' and A.B. Sainsbury, Chapter 28 - 'The Front Line: Convoy HG76 - The Defence'

¹² Milner (2005), pp.75, 85-86, 93 and William Glover, Chapter 10 - 'Manning and Training in the Allied Navies', P.204, King insisted on trying to maintain personal control and it is possible that his notorious anglophobia was merely a way disguising his desire to retain control of the USN's overall operations. It is notable that US submarines were the one part of the USN that proved ill prepared for

The result was a second 'happy time' for the U-boats and a dramatic rise in sinkings off the US coast, particularly of the oil tankers that were critical to Allied survival. For several weeks, the U-boats appeared to have the decisive advantage in the Western Atlantic and food, sailors, and war supplies were being lost at a terrifying rate.

In January 1942, Captain Gilbert Roberts, a veteran officer unable to serve at sea due to a tuberculosis infection, was summoned to the Admiralty and directed to the office of the Second Sea Lord, Sir Charles Little. The First Sea Lord's adviser on Anti-Submarine Warfare (ASW), Admiral Sir Cecil Usborne, was also present as the Prime Minister's representative. Winston Churchill wanted to know if the navy had the capability to defeat the U-boats and, if not, what needed to be improved. Usborne had discussed the situation with Admiral Sir Percy Noble at Western Approaches Command in Liverpool, and the solution they had identified was a tactical unit that could develop and review new ASW tactics and emerging technologies and then develop a course to train officers about to deploy on escort duty. The new unit's activities would supplement the existing hands-on 'working-up' course, run at Tobermory by Commodore Gilbert Stephenson¹³, and serve as a test-bed for tactics being developed for the regularly updated *Western Approaches Convoy Instructions* (after September 1942, these became the joint RN/RCN/USN *Atlantic Convoy Instructions*)¹⁴.

Roberts was tasked to train a small team of analysts, to be called the Western Approaches Tactical Unit (WATU), and identify tactics that could be used to turn the tide of the battle in the Atlantic¹⁵. His selection was based upon his role in the Fleet Exercises in 1935 and his period at the Royal Navy's Tactical School in Portsmouth between 1935 and 1937, where he had been an enthusiastic proponent of wargaming as a useful tool for both training and analysis – though it is notable that his suggestion that the school use a wargame to model the potential threat from commerce raiding was studiously ignored¹⁶. The seriousness of the appointment was made even clearer after a brief face-to-face meeting with the Prime Minister who growled "find out what is happening in the Atlantic, find ways of getting the convoys through, and sink the U-boats!"

war in 1941 and it took over a year for them to reach peak efficiency against the relatively mediocre Japanese escort flotillas. For a US perspective see Clay Blair, *Hitler's U-boat War: The Hunters, 1939-42* v.1 (Vol 1) & *Hitler's U-boat War: The Hunted 1942-45 (Volume 2): The Hunted, 1942-45* Vol 2, Cassell & Co, (2000). There were a series of wargames dealing with ASW issues in the 1920s but only one of these dealt with the Atlantic (Tac 93 in 1923 examined a mixed engagement against the RN with submarines on both sides). See Dr. Thomas Choinski (forthcoming paper on Dramaturgy, 'Wargaming and Technological Innovation in the United State Navy: Four Historical Case Studies'.

¹³ Richard Baker, *Terror of Tobermory: Vice Admiral Sir Gilbert Stephenson*, Birlinn (2006).

Stephenson was an eccentric genius who made a huge contribution to the effectiveness of the Escort Groups. See also Atlantic War Conference, Chapter 10, P.198

¹⁴ Milner (2005), pp.125-6, Finally solving the problem of Allied escorts not understanding each other's ASW signals – such as a RN *Pineapple* or a USN *Zombie Crack*

¹⁵ 'Interim Progress Report by Naval Advisor to First Sea Lord on U-boat Warfare,' Vice Admiral C.V. Usborne, 20 January 1942, ADM 205/21, 'Minutes of the 32nd Meeting held in the Upper War Rook, Admiralty House, at 1130 on 7 April 1942, to Consider Trade Protection Measures,' DTD, 7 April 1942, ADM 199/2082, and, Vice Admiral C.V. Usborne, Naval Advisor to 1st Sea Lord on U-boat Warfare, 14 April 1942, ADM 205/22A, See also Atlantic War Conference, Glover, Chapter 10, pp. 202-3

¹⁶ Williams (1979), pp.70-72

On arrival in Liverpool, Roberts was surprised to find that interest had already waned. Admiral Sir Percy Noble, then commanding Western Approaches Command at Derby House, had assured Osborne of his support for WATU in their initial meeting, but was far too busy to do more than dismiss Roberts to the uppermost floor of the Exchange Flags Building, part of the complex that included Derby House, after a short discussion marred by confusion over Roberts' experience at the Tactical School and his suitability for the role¹⁷.

Roberts' first concern was to find out what was happening to the convoys, so he pored over the after-action reports looking for clues to the U-boat's tactics. He questioned naval officers visiting Western Approaches Command and it became clear that almost the only tactic that was being followed was to dash to the assumed location of the attacking U-boat and conduct an ASDIC sweep in the hope of finding the enemy, or forcing them to abandon their attack and 'go deep'. One of the most interesting discussions was with Commander Frederic 'Johnny' Walker, one of the few officers that had developed tactics to counter the U-boats at night - on the signal "*Buttercup*", the escorts under his command would turn outwards and fire a spread of star-shells in the hope of locating any surfaced U-boats lurking around the convoy¹⁸. Another successful officer, Commander Clarence Howard-Johnson, stated that he generally ordered his escorts to widen their search after an attack, radiating outwards and zigzagging to maximise their coverage. Roberts was intrigued and decided to investigate why these tactics worked.

The WATU facility was primitive, with tactical tables, a tactical floor divided into squares, basic ship models, and a small lecture theatre, but Roberts quickly got to work. A basic set of wargame rules were developed, and a set of processes were designed to represent real-time decision cycles, tactical doctrine, and communications issues. Then the room was re-arranged so that players representing escort commanders could only see the gameplay through a restrictive canvas screen (see photograph on page 8) to represent the limited information that they would have in a real battle while the adjudication team moved the model ships according to the orders submitted by the players and their unseen adversaries. Orders were simplified to facilitate gameplay; each chit outlining the vessel's course, speed, radar track, ASDIC profile, and the commander's intent - each turn represented two minutes of time. The U-boat track was drawn on the tactical floor in brown chalk line, so it would be invisible to players looking through their assign canvas slit but allow the umpires and 'movers' to still follow its progress.

Roberts was assigned a small staff to assist him. Chief Yeoman Raynor was the first to arrive from the Tactical School at Portsmouth, then the young women assigned to the unit from the Women's Royal Naval Service appeared. The four Wren officers, Elizabeth Drake, Jane Howes, Jean Laidlaw and Nan Wailes, were described as 'real gems' by Roberts, all brimming with enthusiasm and delighted to be doing serious work. In addition, four WRNS ratings also arrived, two were only seventeen. One of the

¹⁷ Sir Percy assumed that Roberts was a surface gunnery specialist as many of the wargames he ran at the Tactical Focused were focused on gunnery (he was G on the staff)

¹⁸ Doherty (2015) suggests that Walker's tactic may even have silhouetted Audacity and made her an obvious target

younger ratings, Janet Okell got lost in the building trying to find WATU during a blackout and was in tears by the time she was introduced to Roberts by her burly Royal Marine rescuer; an inauspicious beginning for one of the most talented analysts of the war. The Wrens had to be trained in ASW techniques and technology before they could be useful, but the team proved quick learners and soon mastered the skills they needed to run the analytical and training wargames that were to become the WATU's contribution to the war effort.



WATU Wren Officer (confirmed as Laidlaw in The Sphere – May 26th, 1945) explaining the situation to Tooley-Hawkins playing an Escort Commander (Photo IWM Collection)

Armed with the information he gained from his interviews of returning escort commanders, Roberts set about finding out how U-boats made their attacks and what approaches they used to evade the escorts. Roberts quickly identified a key flaw in the existing approaches – very few escort commanders considered the U-boat commanders' point of view. As a result, they often depended on luck and not calculation when choosing where to start an ASDIC search-pattern. Realising that the key to understanding the enemy was seeing the problem from their perspective, Roberts studied the reports on U-boat attacks on convoy HG-76 to evaluate how best to approach a convoy during a night attack. As the team analysed the descriptions of the attacks on the convoy and wargamed alternative approaches, it soon became obvious that the optimum approach for the U-boat was not to attack from outside the defensive perimeter but to move stealthily between the lines of supply ships on the surface, selecting their target at leisure and then using their intended victims as cover¹⁹!

Roberts called RN Submarine Command hoping to consult an old friend, but the phone was answered by Admiral Sir Max Horton, a WWI veteran and the Flag Officer at RN Submarine command. Horton patiently listened to Roberts' theory and confirmed that

¹⁹ A tactic favoured and promulgated by Otto Kretschmer, commander of U-99

it was the approach that he himself would use, particularly as the maximum range of the standard German torpedo was 5,400 yards (the average firing distance would thus be far less) which would require the U-boat to launch from well within the escort screen. Delighted by Sir Max's confirmation, Roberts set up a new series of wargames to explore options for countering the approach the team had identified.

It was getting late but Raynor, Laidlaw and Okell stayed behind to test the concept on a convoy escorted by six vessels. A range of U-boat attack options were tested, and it was clear that the best approach for a U-boat was from astern of the convoy. The obvious conclusion from their analysis was that Walker and Howard-Johnson had both intuitively come upon a tactic that worked best against any additional U-boats trying to join the battle and not against the original attacker. As Roberts re-examined Laidlaw's detailed plots from each game and her meticulous record of the discussions, he realised that a U-boat that evaded an escort would probably dive and come up again astern of the convoy. The team agreed that he was onto something and volunteered to continue wargaming.

The tactic they found most effective was a coordinated pre-determined movement activated by a simple one-word signal involving most of the escorts falling back after the initial attack then trawling up to the convoy with an ASDIC sweep in line astern, thus catching the U-boat as it switched off its engines and allowed the convoy to pass overhead. The key to the tactic was that the escorts had time to manoeuvre as the convoy slowly steamed over the hidden U-boat's position. The theory was that the U-boat commander would assume that the escorts were conducting a general sweep or searching within the convoy and would thus be caught by the targeted sweep converging on the rear of the convoy. As dawn rose, the exhausted team were sent home and Roberts arranged a demonstration.

A sceptical Sir Percy Noble arrived with his staff (including Howard-Johnson) the next day and watched as the team worked through a series of demonstration attacks on illustrative convoy based upon HG-76. The team started with a run through of the original narrative, showing how the U-boats were evading the standard ASW tactics. Roberts then described the logic behind their assumptions about the approach being used by the U-boats and demonstrated the counter-move; one that Wren Officer Laidlaw had mischievously named *Raspberry*.

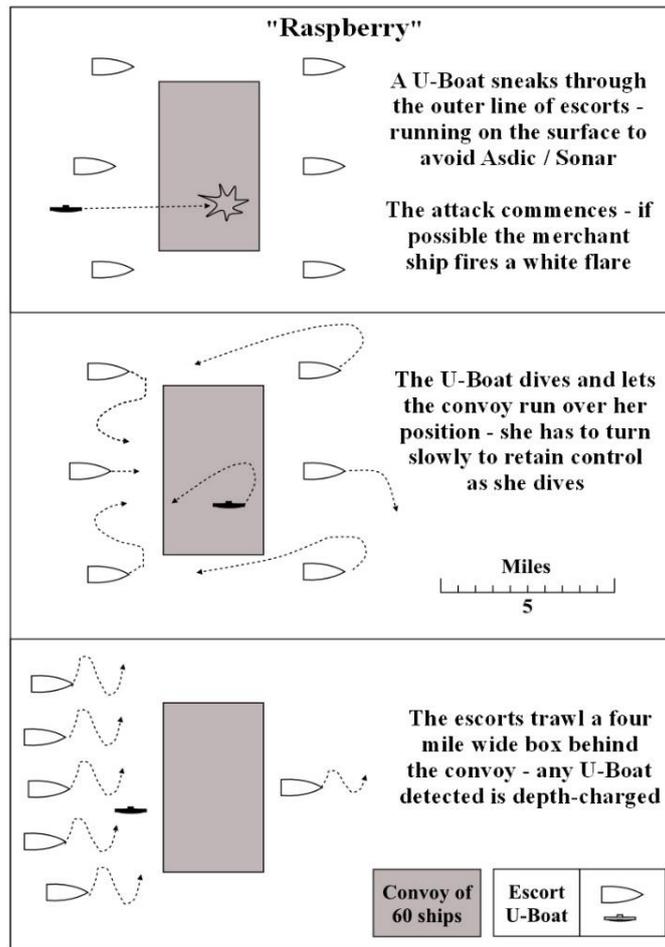


Figure 1: Illustrative Schematic of a Raspberry in Progress

Sir Percy Noble's demeanour changed dramatically as the demonstration unfolded. Unlike every other approach, the solution WATU had identified was based upon the U-boat commander's most logical course of action and not just a reaction to a stricken merchant vessel. The new tactic was immediately sent up to the Admiralty and Roberts was promoted on the spot. From now on the WATU would be regular visitors to the Operations Room, and Sir Percy ordered that all escort officers should attend the ASW course that the team were designing. Interestingly, after the demonstration, Roberts was sent to London to review interrogation transcripts from captured U-boat personnel, and these confirmed many of the assumptions made in the first series of wargames.

The first course included both junior officers and veteran escort commanders. Roberts wanted the participants to use the wargames to share their ideas and experiences, and deliberately using mixed groups of officers proved a very effective way of ensuring that the wargames were more than just rote demonstrations of doctrine. The training wargames appear to have been designed to highlight the issues and problems that escort commanders would face during an engagement with the results based upon detailed tables listing the projected capabilities of Axis and Allied weapon systems. Roberts debriefed the assembled officers on the results of each game and these were a key part of the process. The analytical wargames were more open-ended with multiple iterations of the same scenario and more extensive discussions on potential German tactics and technology. Out of the 5,000 officers, drawn from a wide range of Allied nations, who

attended the school, none had the slightest problem with being instructed by young Wrens - particularly as they proved extremely skilled at guiding their students through the more complex manoeuvres without hurting their feelings²⁰. During the battle to defend convoy ONS 122, the senior escort officer noted that 'it was a pleasure to see (and hear) the Norwegians go into action, *Raspberry* went like clockwork and whenever, during the night, the cry of "Tally-ho" was heard on the scam, I only had to check the bearings' to know where a U-boat was being hunted²¹.

Each of the courses looked at ASW and surface attacks on a convoy and the students were encouraged to take part in the analytical wargames that evaluated potential new tactics. *Raspberry* was soon followed by *Strawberry*, *Gooseberry* and *Pineapple* and as the escorts went over to the offensive, the tactical priority increasingly shifted from defence to hunting and killing U-boats. WATU also ran courses for escort groups deploying to other theatres and ran training wargames looking at potential engagements with surface raiders – one, codenamed *Umbrella*, explored options for drawing off the raiders and another explored potential approaches for conducting swarm attacks on surface vessels²². The PQ convoys transiting to North Russia faced unique challenges and the potential threat from both air and surface vessels was added to the wargames offered to these officers. Wargames looking at improving collaboration between surface vessels and escorts were particularly important, as aircraft - even before the introduction of rockets, Leigh Lights, improved depth charges and acoustic torpedoes – tended to force any U-boats trailing a convoy to submerge and abandon their pursuit. Forcing U-boats on the patrol lines to dive was an effective way of reducing their ability to spot a convoy.

Roberts continued as Director of WATU throughout 1942 but was also appointed as Assistant Chief of Staff Intelligence at Western Approaches Command to ensure that he had access to the intelligence data he needed to continuously update the course. One piece of intelligence that began to intrigue him was a set of reports of U-boats being spotted ahead and to the side of the convoy's course. This was clearly a 'sighting' submarine, reporting on the convoy's position and acting as a marker for other U-boats. If forced to dive, the U-boat usually sent a standard signal after two hours. Roberts noted that this could be used to warn the convoy that a wolf-pack was converging on their position. Alternatively, the escort group could then opt to attack the U-boat while the rest of the convoy changed course or even try to sink the U-boat before it signalled. The latter was clearly the more rewarding challenge and the team set about wargaming the various options. It soon became apparent that a U-boat had the option to 'go deep' immediately if he thought he was at risk (and attempt to reacquire the convoy later) or they could opt to dash off a brief signal. Roberts was sure that most U-boat captains would prefer to send a detailed signal so assumed that their default tactic was to evade

²⁰ Williams (1979) pp.101-102 and Nicholas Monsarrat, *The Cruel Sea*, (1951) pp.278-280

²¹ Milner (2005) P.128

²² 'Operation "Umbrella": Description of Raider Exercise,' C-in-C, WA, 3081/0770/65, M.014064/42, 25 October 1942, ADM 1/11931, 'Raider Exercise,' Admiral Percy Noble, Commander-in-Chief, Western Approaches, WA.3081/0770/65, 25 October 1942, ADM 1/11931, 'Operation "Umbrella" (for use by day),' Commander Gilbert H. Roberts, [WATU], Enclosure to, 'Raider Exercise,' Admiral Percy Noble, Commander-in-Chief, Western Approaches, WA.3081/0770/65, 25 October 1942, ADM 1/11931

to the rear of the convoy to avoid any escorts and then calmly report on any changes in convoy's course or dispositions. The discussions during the team's next series of analytical wargames confirmed the evidence drawn from signals intelligence that the U-boat's best option was to conserve its batteries and conduct a low-speed turn to its new position before sending the vital signal. The U-boat would thus have to be sunk by stealth if the escort wanted to destroy them before they signalled.

The solution the WATU games suggested was to allow the 'sighting' submarine to dive unmolested once it spotted an escort getting too close, but not to pursue immediately so that the U-boat wasn't alerted. As soon as the assigned escort was between the convoy and the submarine, the Allied vessel would suddenly increase speed and dash to U-boat's assumed position, using the convoy's combined propeller noise as cover, and then turn on their ASDIC once they were almost on top of the U-boat's predicted position. This process was named the *Beta Search*.



WATU Wren organising a set of convoy markers for a wargame (Photo IWM Collection)

In November 1942, Sir Max Horton was promoted to Commander in Chief Western Approaches and after hearing Roberts' brief on the work being conducted at WATU, volunteered to play a U-boat commander during his first visit to the unit. Roberts decided to ask the admiral to test the new tactic and the now eighteen-year-old Janet Okell was assigned the role of escort group commander. This apparently controversial selection was probably based on Okell having repeatedly demonstrated an instinctive grasp of U-boat tactics, a conclusion supported by the sequence of pictures of WATU at work (taken later in the war) where she is shown sitting at the adjudication table playing the U-boat commander.

Sir Max made five attempts to evade the escorts and each time Okell ruthlessly closed in and sank his U-boat. Horton was a skilled submariner but there was no way that he could confirm precisely when he had been spotted, taking away one of his major advantages over the convoy escorts. Each time he dived to avoid a patrolling escort and attempted to carefully manoeuvre into position to send a signal, his first clue that Okell had found him was the adjudication team telling him that he had been 'pinged' by

ASDIC and was being depth charged. After the third defeat, he even insisted on checking what the escort player could see of his U-boat's track through the grill before returning to his tactical table to write new orders²³. When the notoriously ruthless and blunt Admiral Horton discovered that his opponent had been a young Wren rating, he was apparently horrified but, unlike many senior officers (then and today), he was far more interested in results than in his ego and *Beta Search* was included in the next set of Fleet Orders. HMS Vidette was the first ship to try out the tactic and bagged a U-boat with its first pattern of depth charges. Once again, the Royal Navy had shown that they could seize the initiative from their stealthier opponents.



Wargame in progress (1944) with a Wren Officer (possibly Laidlaw) indicating a torpedo strike, Roberts directing the game and Janet Okell glancing over her shoulder to peer at the camera (Photo: IWM Collection)

As the U-boat commanders developed new tactics, WATU's enthusiastic and dedicated operational analysis team quickly identified each new approach and developed effective counters; the Germans often losing numerous U-boats before any weaknesses of the new tactic became apparent to Dönitz and his rapidly decreasing cadre of veteran commanders. The team also examined tactics developed by operational escort commanders and disseminated these to the escort groups once their tactical effectiveness was established. An example is the *Observant* tactic developed by HMS Spey, which WATU tested and deemed effective, but made improvements after their devious U-boat players discovered a gap in the pattern that a skilled submariner could exploit²⁴. *Pineapple* was developed from a suggestion from a Canadian officer on how the Germans might shift their tactics if *Raspberry* was observed by a second U-boat

²³ W.S. Chalmers, *Max Horton and the Western Approaches*, Hodder and Stoughton, 1958, P.168

²⁴ 'OS 33,' Operations Secretariat Records, n.d., ADM 237/144, Minute, C.D. Howard-Johnston, SOAS, 20 October 1942, ADM 237/144

beyond the range of the initial sweep. *Pineapple* also assumed that U-boat commanders were not uniformly aggressive. The first objective of the new tactic was to force the sighted U-boat to dive by racing towards the enemy position, then conduct a more deliberate sweep of the optimum attack vectors to catch the ones that didn't go deep²⁵.

Roberts was fully aware of the proven skills of his adversary, and WATU did not wait for German tactics to evolve before adapting. Roberts used his access to intelligence data to compile a detailed history of known U-boat tactics and used the WATU wargames to evaluate possible adaptations of old tactics or to explore the capabilities of emerging technological breakthroughs. In addition, each course was attended by at least one Coastal Command officer to ensure that air/sea co-operation was properly represented and that any opportunities for joint operations were fully explored²⁶. In the early years, U-boats could dive and avoid aircraft but as tactics, airborne radar systems, and weapons improved, Allied planes started to turn the tide against the U-boats²⁷. WATU graduates were regularly popping by to share their experiences and these often proved invaluable. Peter Gretton, one of the most successful escort commanders of the war, was one of these regular visitors to the Unit²⁸.

Dönitz started to believe that the increased number of escorts, including Canadian and US vessels, was increasing the risk to his U-boat commanders. The obvious solution was to increase the size of the wolf-packs so that the escorts would be completely overwhelmed. Wolf-packs made every ASW tactic more difficult to operate, as the first U-boats to arrive would observe their target and signal any changes in the disposition of escorts to the rest of the converging pack. Once enough were in position, the whole group would begin to look for weak points in the convoy's screen. As the escorts homed in on the first U-boat detected by ASDIC, radar or observers, the rest would move in through any gaps and hunt the exposed merchant vessels at their leisure. Faced by a cascade of reports of U-boats, the escorts would be reduced to dashing from one crisis to another while the experienced German captains picked their targets and then left the less skilled U-boats to suffer the consequences. Unsurprisingly, WATU had predicted the increased impact of larger wolf-packs and, amongst their solutions, had proposed that air power (B-24s with extra fuel tanks or convoy escort carriers) could be used to hunt any surfaced U-boats awaiting updates on the convoy and gathering in her wake.

The WATU team also developed and tested pre-determined tactics for a range of situations – for example suggesting using an outer and inner ring of escorts for major wolf-pack attacks – with the outer screen dealing with the detection of incoming U-boats and the inner screen protecting the heart of the convoy from the veteran commanders that preferred to use the pursuit of their comrades as cover. This was the genesis of the Support Group tactics that were to dominate the second half of the Atlantic War. In all, five Royal Navy Support (Escort) Groups were created (the US

²⁵ Commander Douglas Prentice (RCN) named the tactic *Major Hoople* but WATU re-named it *Pineapple* after making several improvements

²⁶ Gretton (1971) P.177, Gretton highlights the master of a Merchant Aircraft Carrier having taken the course before being assigned to his B7 Escort Group

²⁷ Milner (2005), pp.113-114, Milner notes that, in early 1942, few submarines were sunk by aircraft but, by 1943, they were inflicting the lion's share of the kills. Atlantic War Conference (1994), Chapter 9 - Willmott notes that the improvements in coordination led to a 90% contact rate

²⁸ Gretton (1971) pp.107-8, Gretton eventually married Judith Duvivier, one of the WATU Wrens

Navy created similar hunter-killer groups), often deploying with a dedicated escort carrier. These were despatched to assist convoys under imminent threat of attack – both to strengthen the escort and enable more offensive tactics against any U-boats converging on the convoy – the most famous of these units was ‘Johnny’ Walker’s Support (Escort) Group 2. It is important to note that the concept was reliant on access to accurate intelligence to direct the Support Group to where they would have the most effect²⁹.

Sir Max Horton worked closely with the WATU analysts and he was so delighted with the display Roberts and his team put on when King George VI visited WATU that he volunteered to take the course himself. The Admiral stayed for the whole week, attending the lectures and taking part in the wargames. This commitment might seem unusual for an operational commander fighting a major campaign, but Horton was keen to learn how WATU developed new tactics and understood the importance of being seen to embrace new approaches. When a petty bureaucrat in Whitehall unwisely threatened to remove Roberts’ clearance to read classified material linked to WATU’s work, because he was merely a retired acting-captain, Horton hunted down the offending individual and ‘pinned back their ears’³⁰.

WATU’s facility was eventually duplicated at Maydown in February 1943, at HMS Shrike, with a focus on air-sea collaboration – eventually becoming the Combined Anti-Submarine Training Centre. Similar facilities were created to support the main Allied navies. The Canadians sent numerous officers to take the WATU course but also developed their own training capability at Halifax, Nova Scotia in May 1942, under the control of the formidable Commander (later Admiral) J. C. Hibbard. Like Roberts, Hibbard identified coordination as the key to success and created a Night Escort Attack Teacher rig to enhance training³¹. Sadly, the USN’s senior leadership were less keen on direct collaboration but did create both the Submarine Chaser Training Centre (commanded by the energetic and innovative Captain Eugene McDaniel³²) and the Atlantic Fleet ASW Unit in Boston (later the Anti-Submarine Warfare Operations Group) in March 1942. In the latter unit, Admiral Wilder D. Baker and his colleagues developed new ASW tactics for the US Navy and fulfilled many of the functions of the Royal Navy’s operational research team, making a major contribution to US air-sea coordination. Baker’s team were later absorbed into Admiral King’s integrated 10th Fleet Command in May 1943 after the Atlantic Convoy Conference³³. Eventually, the insights of all these teams were combined with WATU’s in the *Joint Atlantic Convoy Instructions*.

²⁹ Gretton (1974), P.174, notes that the operations in Spring 1943 were guided by ‘intelligent anticipation’ after the flow of traffic from Bletchley Park dried up

³⁰ Williams (1979), P.117

³¹ William Glover - Chapter 10 – ‘Manning and Training in the Allied Navies’, pp.203-4, see also Correlli Barnett, *Engage the Enemy More Closely: The Royal Navy in the Second World War*, Hodder and Stoughton, (1991)

³² Thomas Cutler, *The U.S. Navy Reserve*, US Naval Institute (2015), Chapter 8. McDaniel included numerous women on his analytical staff but wargames were not prioritised in the curriculum

³³ Blair (2000) on ‘Exploiting British ASW Capability’, Charles Shrader, *History of Operations Research in the United States Army*, Vol. I: 1942-62 (2006), pp.21-23 and Atlantic War Conference (1994), Philip Lundberg, Chapter 19 – ‘Allied Cooperation’. Operational Research papers were regularly exchanged after 1942

At the Casablanca Conference in January 1943, Roosevelt and Churchill re-affirmed the necessity to target the U-boats and keep the convoys flowing³⁴. The Allied leaders were keen to maintain momentum and to turn the tide in the West. The Allies were already conducting operations from Kharkov to Tunisia and the campaigns of summer 1943 would see the Soviet Army destroying the Wehrmacht's main panzer reserve at Kursk and the US/UK amphibious operations in Sicily and Southern Italy. By 1943, new tactics and technologies, including centimetric radar and the Hedgehog mortar (a device that projected a pattern of bomblets ahead of the escort each capable of damaging a U-boat if they made a direct hit – thus enabling ASDIC contact to be maintained), being used by Allied escorts meant that the U-boats had to develop even more cautious tactics as they attempted to evade the wide array of ASW assets (air and sea) that were being deployed against them with ever increasing efficiency. Dönitz and his captains tried numerous desperate tactics, but casualties continued to mount. Even when wolf-packs succeeded in making an attack, they tended to suffer heavy casualties.

In spring 1943, Patrick Blackett, Director of the Royal Navy's Operational Research department, submitted a series of reports based upon detailed analysis on the convoy battles of 1939 to 1942. Blackett supported Roberts' argument for larger convoys with stronger screens and for increased air cover on the Mid Atlantic Air Gap³⁵. From this point onwards, the constant flow of intelligence reports, operational research (OR) reports and wargames gave Western Approaches Command a priceless advantage over the U-boats. The evolving convoy battles in spring 1943 show how far the tactics and technology involved in the anti-U-boat campaign had developed and highlights the role of WATU in the integration of these elements into the decisive instrument Churchill had demanded in 1942.

When convoy SC-118 was attacked in January 1943, the deputy convoy commander (the commander was unwell) had not attended the WATU course and the deployment of the escorts left the rear of the convoy to just one Free French corvette, FFL Lobelia. Luckily her commander, Pierre de Morsier, was a graduate and fought a brilliant rear-guard action, engaging U-boat after U-boat and expending all 180 of his depth charges defending the beleaguered convoy. Roberts always spent extra time with his foreign students and many of his star pupils were from the navies of the other Allied powers³⁶. Horton used the detailed analysis of the attacks on SC-118 to support his plan to create Support Groups that could be directed to reinforce a close escort screen and take the battle to the wolf-packs.

In March 1943, HX-229 and SC-122, with thirteen escorts protecting over ninety merchant ships, found themselves fighting one of the largest combined wolf-packs of the war. Raubgraf (Robber Baron) made the first sighting and two more packs (Stürmer and Dränger) closed in as the two convoys entered the Mid Atlantic Air Gap. The

³⁴ 'The Significance of the Casablanca Decisions, January 1943' by Alan F. Wilt, *The Journal of Military History*, Vol. 55, No. 4 (Oct 1991), pp. 517-529

³⁵ Milner (2005), P.147 and Atlantic War Conference (1994), Paul Sutcliffe, Chapter 23 – 'Operational Research in the Battle of the Atlantic' and Peter Padfield, *War Beneath the Sea*, Thistle (2013), Padfield noting the story about Blackett suggesting that Coastal Command paint their aircraft white to make spotting them more difficult (P.321), a story also included in Gretton (1974), P.165

³⁶ For a more detailed description of the action, see Williams (1979) and Pierre de Morsier, *Les Corvettes de la France Libre*, France-Empire (1972)

engagement lasted several days and saw numerous attacks by the three wolf-packs. HX-229's formation had been broken up by bad weather and saw the surprise introduction of the latest German Flächenabsuchender Torpedos (FaT) – a weapon that followed a weaving pattern ('pattern running') after launch to increase their chances of a hit on a convoy. The escorts raced from crisis to crisis, but the U-boats kept finding gaps in the screen, some even approaching in daylight to maximise their chances of hitting a merchant vessel. Without aircraft to protect the perimeter, there were simply too few escorts to keep the U-boats at bay. SC-122 was initially only attacked by U-338, commanded by a skilled and audacious young commander called Oberleutnant Manfred Kinzel, but others soon joined the melee and the screen was soon scattered as they desperately tried to force their tormentors to dive. The arrival of the latest long-range ASW aircraft on the periphery of the Black Pit finally forced the U-boats to break off their pursuit. During the battle, twenty-two ships were sunk for the loss of one U-boat. Dönitz was delighted, describing the action as 'the greatest convoy battle of all time'. Horton knew that the policy of keeping one third of the escorts back to complete their training had been an unpopular decision, but he was confident that the tide was about to turn. 'The real trouble has been basic – too few (escorts), all hard worked with no time for training... The Air, of course, is a tremendous factor – it is only recently that the many promises that have been made show signs of fulfilment so far as shore-based aircraft are concerned, after three and a half years of war... All these things are coming to a head just now and although the last week has been one of the blackest on the sea, so far as this job is concerned, I am really hopeful.'³⁷

In late April 1943, convoy ONS-5 set off from the UK and headed for North America. Peter Gretton's B7 Escort Group were protecting forty-two merchant ships. Two wolf-packs, totalling fifty-eight U-boats, were already strung out across the Atlantic awaiting a suitable target. U-boat Command's B-Dienst had already identified SC-127 but decided that ONS-5 was a better target. A RAF Liberator gave the first clue that the convoy was in danger when it sank U-710 but few realised that they would soon be forced to fight for seven days against a force of over forty U-boats. Gretton had rehearsed the route on a tactical table with all of his air and escort commanders and updated WATU on his experiences during the successful transit of HX-231³⁸. After that action, Gretton was keen to ensure he had a dedicated escort tanker attached to the convoy due to HMS Duncan's fuel-hungry engines (a common problem with fast escorts), and had re-trained his men in close gunnery for night-fighting. He had also reminded the Admiralty that most of his casualties on HX-231 had been stragglers who drifted (deliberately or due to battle-damage) beyond the escort screen. The new convoy was a slow one and they had air cover until the Greenland ice pack. HF/DF located a U-boat, but no contact was made and Gretton readied the convoy for a wolf-pack attack. Fourteen U-boats converged on the first night and Gretton concentrated his screen on the port beam. The weather worsened, and HMS Tay reported the first U-boat. Radar soon showed three other U-boats closing in and the escorts raced to engage

³⁷ John Keegan, *The Price of Admiralty, War at Sea from Man of War to Submarine*, Hutchinson, (1988), pp. 244-266

³⁸ Peter Gretton, *Crisis Convoy: The Story of HX231*, Davies (1974)

them and forced them to dive. The pitching and rolling made depth charging difficult and no kills were made.

On the next night, Tay was sent to discourage U-boats from shadowing the convoy, but one got between the columns and launched a full spread, hitting one merchant ship before making its escape. As the formation recovered, the weather continued to batter the convoy, but the U-boats were in no mind to give up, particularly as the weather served to protect them from any attempt at air interdiction. They shadowed the convoy for another 24 hours, with individual captains making attack runs, but the wolf-pack was unable to coordinate their attacks. Gretton was finally forced to withdraw his own ship from the convoy due to a damaged boiler and lack of fuel. As soon as he departed, the U-boats converged again, this time they were reinforced by an additional wolf-pack that had missed SC-128 and was re-directed to intercept ONS-5. The combined pack numbered more than thirty U-boats and with the weather gradually improving, they surprised the escorts. With the screen soon overwhelmed, the wolf-pack managed to get amongst the columns and sink eleven merchant ships as the escorts desperately tried to re-establish their formation. The U-boats' triumph would be short-lived. As fog shrouded the convoy, the tables were turned and the U-boats found themselves being hunted by the escorts. All twenty-four attacks in the final phase of the battle were driven off and four U-boats were sunk and three more heavily damaged by Mid Ocean Escort Force B7 and Escort Group 1, supported by a small number of Canadian flying boats. By the time the convoy reached her destination, thirteen merchant ships had been lost but seven submarines had been accounted for, a very poor result for the U-boats after seven days fighting in near optimum conditions (the fog being the only stage of the battle where the escorts had the advantage). Tay reported the result to Gretton and the Admiralty, 'all ships showed dash and initiative. No ship required to be told what to do and signals were distinguished by their brevity and wit'. No higher compliment can be paid to the WATU course than the efficiency shown by her graduates in this battle³⁹.

Gretton's B7 command was then assigned to protect SC-130 in mid-May. The older ships produced huge columns of smoke and the Senior Escort Officer, Captain J. Forsythe, was concerned that every U-boat in the North Atlantic would see them as soon as they reached the inevitable patrol line. After avoiding a large iceberg in heavy fog, the convoy headed East. Gretton's team were confident, having survived two harrowing convoys, and they were eager to apply the principles developed at WATU. The convoy also had a rescue ship, which would both free up the escorts and assist with HF/DF. Unsurprisingly, they soon picked up a signal and the hunt was on. Gretton forced the first set of U-boats to go deep and the convoy shifted course, thus avoiding the initial ambush. RAF/Allied Liberators were despatched to hunt the pursuing U-boats and the escorts readied for the next wave to come in. Two more U-boats were chased off and Gretton's hedgehog damaged U-381. Gretton then directed the attacks of another vessel (using Walker's creeping attack method to guide the other escort⁴⁰)

³⁹ Gretton (1971), pp. 139-150

⁴⁰ The creeping attack used two ships; one escort to remain stationary and keep in contact, and guide a second vessel onto the target. The second escort approached slowly, in order not to warn the U-boat of its approach, and released its depth charges on a signal from the first. The method required practice and took time and numerous depth charges, but was extremely effective. Walker's two commands, 36 Escort Group and 2nd Support Group, were arguably the most successful U-boat hunters of the war

against three separate U-boats. His colleague, clearly feeling a little harassed during the chase, ruefully signalled to Gretton ‘as Mae West said, one at a time, gentlemen, please’. With up to thirty submarines circling, the escorts were kept busy. Gretton directed escorts against the closer targets and aircraft against the converging U-boats, holding off the wolf-pack until 1st Escort Group arrived. With indications of another wolf-pack showing up on HF/DF, the convoy changed course and avoided a second ambush. In the end, only one U-boat attempted to engage the convoy and they were soon forced to dive. Several more turns bought the convoy back on course and more RAF/Allied Liberators joined the battle, sinking U-258. The battle had been a perfect demonstration of close coordination between Western Approaches Command, the Escort Groups and Coastal Command. Three U-boats were sunk, one was damaged, and no merchant vessels were lost. Dönitz himself gave Gretton and his colleagues the ultimate compliment in his memoirs: ‘the convoy escorts worked in exemplary harmony with the specially trained support groups. To which must be added the continuous air cover provided by the carrier-borne (diverted from HX-239) and the very long-range (VLR) shore-based aircraft, most of them Liberators equipped with the new radar’.⁴¹

Once Dönitz realised that the balance between merchant sinkings and U-boat losses had invalidated his strategy, he withdrew the majority of his boats from the most contested waters. Herbert Werner, then on U-230, lists the signals pouring in from stricken U-boats during this period and it is easy to understand why fewer and fewer U-boats were prepared to close with a convoy⁴². WATU took advantage of this lull in activity on the Western Approaches to develop tactics for other operational areas and to evaluate some of the tactics and technologies being developed by their adversaries. The team also tested new ways to improve air to sea cooperation; using wargames both to develop new approaches and to demonstrate them to students and to any senior officers visiting the facility. When Horton secured the Azores as a base for Allied Liberators, Roberts and the team mapped out a range of options for re-deploying some convoy escorts to increase the number of Support Groups hunting in the regions where the remaining U-boats were concentrated. These reinforcements were now equipped with an impressive array of ASW technologies and supported by Allied Liberators equipped with the latest ASW equipment including improved airborne radar sets (undetectable by the German Metox radar detection device), and almost all were veterans of the WATU tactics course⁴³. In desperation, Dönitz ordered his U-boat commanders to stay on the surface and shoot down any aircraft that attempted to engage them. Casualties on both sides increased significantly, with twelve aircraft being lost for every submarine sent to the bottom, but the Allies had numbers on their side and the Germans were forced to abandon the campaign.

Dönitz refused to give up and turned to his scientists to resolve the situation. Snorkels were increasingly fitted to submarines that were being deployed to regions where the Allies had aircraft patrolling for submarines on the surface. Analysis had shown, after

⁴¹ Gretton (1971), pp. 151-164

⁴² Herbert Werner, *Iron Coffins: A U-boat Commander's War 1939 – 1945*, Cassell, (1969), Part 2, Above us Hell

⁴³ Milner (2005), Milner notes that the RCN were the last to get centimetric Radar sets and suffered accordingly in 1942

several false assumptions, that the Allies had developed a credible airborne radar system and Dönitz was desperate to stop the relentless increase in losses. Another solution was to turn the surface hunter into the hunted and this required a complete change in tactical emphasis, and the development of a weapon capable of targeting an escort as it closed in for the kill. HMS Londonderry, sailing via the Azores, was the first vessel to experience the new weapon. Her commander, John Dalison, sighted a U-boat just off the Azores (he was painting a picture at the time). The target didn't dive immediately and Dalison assumed the U-boat hadn't spotted him though he saw the periscope being raised even higher than usual as if to attract his attention. Seconds from making his attack run, Londonderry's stern exploded, and the vessel was lucky to make it back to port intact.

Dalison was sent to be de-briefed by Roberts and described the failed attack in detail to his bemused mentor. Roberts headed for Horton's office and they agreed that the only plausible solution was some kind of passive acoustic homing torpedo. One solution was to accelerate the deployment of Foxer, a noise-maker that could be towed behind a vessel being targeted by an acoustic homing torpedo. The problem with Foxer was that it also blinded many of the detectors that an escort needed to hunt submarines – it was clear to Roberts that a noise-maker was a useful defensive device for merchant vessels but not for escorts trying to find and kill a U-boat. There had also been hints of an acoustic device in the Oslo Report passed to MI6 in 1939 and R.V. Jones Scientific Intelligence team had already highlighted the dangers such a weapon might pose⁴⁴. Concerned that the Germans might utilise the new weapon in a wolf-pack attack on a major convoy, Roberts circulated a warning to all escort commanders to look out for the strange behaviour noticed by Dalison.

The G7es (T5) Zaunkönig (Wren), soon to be known to the Royal Navy as the GNAT (German Navy Acoustic Torpedo), was issued to twenty-three U-boats in August 1943 and these boats took up position in the Bay of Biscay and the Mid Atlantic Air Gap and awaited suitable targets, the operation was code-named Leuthen. Two convoys were at sea, ONS-18, a slow convoy of twenty-seven ships bound for Canada and the USA, and ON-202, containing another forty-two heading in a similar direction. Horton ordered the two convoys to converge as the Royal Navy's Operational Analysis team had shown that larger convoys were easier to defend than splitting up into smaller convoys – unless the U-boats attacked in very large numbers. B-3 Escort Group, C-2 Escort group and 9th Escort Group were tasked to protect the converging convoys. Confused orders (exacerbated by fake orders sent by U-boat Command) and poor weather delayed the link-up and the T5 equipped wolf-packs started to converge on their target.

A Liberator sank one of the U-boats closing in on the convoy and Horton and his team prepared for what they assumed would be a decisive demonstration of the latest ASW tactics and capabilities. Deploying the tactics developed at WATU, the escorts started hunting the wolf-pack as they infiltrated the convoy. Once spotted, each of the U-boats followed their orders and calmly dived, firing a T5 from their stern tube. HMS Lagan was the first to be hit. HMS Escapade tried to support her but suffered an onboard accident (her hedgehog system exploded). Both vessels were forced to detach from the

⁴⁴ R. V. Jones, *Most Secret War: British Scientific Intelligence 1939–1945*, Hamish Hamilton, (1978)

convoy. HMCS St Croix was the next escort to be struck and HMS Polyanthus quickly followed. The officers and Wrens in the Operations Room at Western Approaches Command listened in growing horror as the reports of escorts being hit flooded in. Undeterred by the chaos, Captain Tooley-Hawkins on HMS Orchis, a popular officer who was engaged to one of the WATU Wrens, took an enormous risk in slowing down to lower clambering nets in the hope of rescuing as many men as possible but noticed that the three U-boats around him were doing nothing to exploit his precarious situation. Fog might have obscured his position but this clearly wasn't stopping them from launching a spread of torpedoes as he could see all three of them watching him 'as bold as brass'⁴⁵. As soon as Tooley-Hawkins had picked as many men as he could, he raced back to the convoy and signalled Liverpool and asked them to pass on what he'd seen to Roberts and his team.

Roberts, reading the reports pouring into Western Approaches Command, quickly realised that this was the new weapon that he and Horton had discussed a few months earlier. He headed up to the WATU tactical floor and summoned the analysis team. The initial reports were reviewed and then wargamed and two key points emerged from their deliberations. The U-boats only engaged when the escort was committed to the attack, having fired star-shell or moved towards the U-boat, and they clearly couldn't engage a vessel that was stationary. Tooley-Hawkins' intriguing experience suggested that the wolf-pack only had acoustic torpedoes so that a tactic that successfully negated the GNAT would also enable the escorts to break up the wolf-pack and force them to disperse. The problem was working out how an acoustic torpedo worked. Luckily, the Allies had their own version, the US Mark 24 mine, known as FIDO. This device was a passive homing torpedo designed to be dropped from ASW aircraft. The Anti-Submarine Experimental Establishment at Fairlie (a forerunner of Dstl) confirmed that a speed of 20 knots would evade an acoustic torpedo but most of the escorts were far slower and ASDIC would be next to useless if the escorts exceeded their normal cruising speed. Roberts soon realised that the solution would have to be based on the way the GNAT homed in on its target. Reducing speed was also considered but this would have clearly been unacceptable to the escort commanders.

After a night of heavy fog, the wolf-pack closed in again. HMS Keppel opened the new phase of the battle by ramming a U-boat and a Coastal Command Liberator sank U-270. HMS Itchen, HMCS Morden and HMS Orchis engaged a U-boat which had got inside the convoy and pursued her into the open sea. Morden managed to avoid one torpedo, but Itchen was blown apart, almost taking Orchis with her⁴⁶. Sadly, many of the sailors rescued earlier in the battle were on HMS Itchen, increasing the total losses to over four hundred. Even though both the escort and U-boat crews were exhausted, the next engagement was clearly the decisive phase of the battle. WATU had continued

⁴⁵ Williams (1979), P.129

⁴⁶ The sources for the engagement are confusing. Tooley-Hawkins testimony is not corroborated elsewhere but this is unsurprising given the complexity of cross-referencing the reports of nineteen Allied warships in a battle lasting several days. See Williams (1979) for Tooley-Hawkin's version, CONVOY ONS 18 / ON 202 REPORTS, National Archives and Records Administration, Washington, <http://www.warsailors.com/convoys/on202report.html> for Horton's report and <http://ww2today.com/23rd-september-1943-another-tragic-night-for-convoys-ons-202-and-18> for the testimony of a Canadian witness who survived both the loss of both St Croix and Itchen

their wargames throughout the battle and Roberts phoned Horton and asked if he could come up to the tactical floor to review their proposed solution. Confident that Roberts and his team could at least explain how the U-boats were operating, Horton headed up to WATU to see what they had discovered.

The team had been frantically trying out options for countering the GNAT as the battle unfolded, their efforts focused by the fact that many of the officers were known to the team. The break-through came when they looked at the effectiveness of the GNAT's hydrophone array and realised that 60 degrees was the optimum angle as a wider array wouldn't be able to focus effectively and a narrower array wouldn't successfully acquire targets that weren't exactly where the U-boat captain predicted. The solution was to turn back 150 degrees after engaging the target and increase to full speed for a mile before turning back to run parallel to the U-boat's course for another mile. The acoustic torpedo would follow its initial course and then fail to detect its intended target; leaving the escort free to close in on the U-boat and commence an attack run. Horton had hoped for a way to evade the U-boats, but this was far better – the new tactic might even turn the tide of the current battle.

The *Step Aside* tactic was immediately sent to the escorts⁴⁷. Tooley-Hawkins, wounded when *Itchen* blew up, was one of the first to acknowledge receipt of the new orders and the WATU team breathed a sigh of relief. The escorts and U-boats continued their battle for the next 36 hours, but no more escorts were sunk, and the remaining U-boats were forced to 'go deep' to avoid destruction⁴⁸. The new tactic had proved its worth and remained on the list of NATO ASW tactics for dealing with acoustic weapons until relatively recently. The Germans claimed a victory, suggesting that twelve escorts and nine merchant ships were sunk, and a further two ships damaged⁴⁹. The reality was that three escorts were lost and six merchantmen. U-boat Command ordered two more attacks based on their 'success' but *Operation Rossbach*, versus SC-143, lost seven U-boats (three to escorts using *Step-Aside*) and sank only one warship and one merchantman. Operation Schlieffen, attacking ONS-20 and ON-206, was even less successful, losing six U-boats and sinking only one merchant ship.

By the end of the war the WATU had eight male naval officers (including a Norwegian and an Indian) and thirty-six female Wren officers and ratings. Amongst the many officers who passed the course were HRH Prince Philip of Greece and the author of *The Cruel Sea*, Nicholas Monsarrat. The novel includes a memorable description of Captain Roberts and it is thought that Robert's summing up of the campaign, given at the end of each course is the source for the book's title; "it is the war of the little ships and the lonely aircraft, long, patient and unpublicised, our two great enemies - the U-boats and the Cruel Sea". The novel also includes a lovely scene where Ericson is caught out during a wargame and is rescued by a "young, thoughtful and intelligent" Wren

⁴⁷ See Doherty (2015), P.223 for an excellent diagram of the tactic

⁴⁸ OEG report No. 51, Antisubmarine Warfare in World War Two, Charles M. Sternhell and Alan M. Thorndike, Operations Evaluation Group, Office of the Chief of Naval Operations, Navy Department, Washington, D.C., 1946 - <http://www.ibiblio.org/hyperwar/USN/rep/ASW-51/>

⁴⁹ Gunter Hessler, Alfred Hosschatt and Jurgen Rohwer, *The U-boat War in the Atlantic*, HMSO (1989), Paras 376-9, the U-boats dived straight after firing and this restricted their monitoring of success to hydrophones

officer "not more than "twenty years old"⁵⁰. Intriguingly, Monsarrat's colourful description of Roberts is backed up by a Canadian officer, A. F. C. Layard, who described the WATU director, a few days after the battle against Wolf-pack Leuthen as a 'very good lecturer, very theatrical and, of course, would like you to know that he was 75% responsible for the recent defeat of the U-boats in the North Atlantic. He's probably right and is certainly thought of very highly here'.⁵¹

When Roberts accepted his award as Commander of the British Empire at the end of 1943, he took a Wren Officer and Rating with him to Buckingham Palace, intentionally sharing the honour with the team of remarkable young women that helped the Western Approaches Tactical Unit win the Battle of the Atlantic. In 1944, Roberts was tasked with planning the highly effective ASW operation that supported *Operation Overlord*. Eventually, Tooley-Hawkings took over WATU and the team concentrated their efforts, in the final months of the war, against Japan. When Roberts visited U-boat Headquarters in Flensburg after the war, he met Admiral Dönitz and they exchanged salutes. Roberts inspected the tactical notes and deployment maps for the period after January 1942 and was delighted to see that they matched many of the WATU assumptions. The only thing that bemused him was the way all the U-boat survivors stared at him as if they feared him. The mystery was solved when he was shown a photograph from a magazine interview hung up in the Operations Room. "This is your enemy, Captain Roberts, Director of Anti U-boat Tactics"⁵².

The role of the WATU is a strange omission from the popular historiography of World War Two. Perhaps understandably, the commanders, the aces, and the technical advances tend to take centre stage and the organisational improvements are often relegated to footnotes or technical volumes⁵³. Much of the problem is that the ASW Tactical Unit continued their work into the Cold War, re-focusing their attention on the threat from Russia's formidable submarine force, a task that required the unit's activities to remain classified. Roberts himself retired at the war's end and most of the team retired to civil life or were poached by other units. Few memoirs mention the WATU, Roberts own recollections in Mark Williams' book perhaps being the only coherent record. Ironically, the brief scene in Nicholas Monsarrat's 1951 novel, *The Cruel Sea*, remains the only public memorial to their work.

⁵⁰ Monsarrat (1951), pp. 374-377, Ericson specifically notes the course was 'tough'

⁵¹ A. F. C. Layard, *Commanding Canadians: The Second World War Diaries of A. F. C. Layard*, UBC (2006), pp.33-35 Layard notes that one of his first wargames included the new 'glide bomb' – showing WATU's continuing interest in developing tactics against emerging threats. Roberts himself confirmed to Thames Television that his lecturing technique was developed with the assistance of the actor, Tommy Handley (IWM Recording 2766).

⁵² Mark Williams (1979), P.144

⁵³ Milner (2005), Doherty (2015) and Gordon Williamson, *U-boats vs Destroyer Escorts: The Battle of the Atlantic*, Osprey (2007) are honourable exceptions



*Captain Gilbert Roberts preparing a scenario for the next wargame in the WATU office
(Photos: IWM Collection)*

The Western Approaches Tactical Unit is a classic exemplar of defence analysis – almost perfectly demonstrating how a dedicated research team should function⁵⁴. The WATU team were able to combine training courses with analysis work, test and disseminate new ideas, actively encourage the development of combined operations, develop new tactics to get the most out of new technologies, and identify and counter enemy technical and tactical innovations in real time. This iterative cycle of activities, centred on the wargames on the tactical floor, were used to create an experiential learning environment⁵⁵, where tactical decisions could be made without casualties and the officers taught to ‘read the battle’ and optimise their tactics instead of following simplistic doctrinal processes that their enemy would exploit. Commander (later Vice Admiral) Sir Peter Gretton later noted that the course ‘improved everyone’ who attended and ordered all duty officers and escort commanders under his command to take part in the WATU wargames. Gretton also highlighted in his memoirs that the wargame ‘made a number of very stupid officers really THINK, sometimes for the first time in their lives’.⁵⁶ Fortunately, this conceptual perspective was not shared by their German opponents, who tended to focus on short-term issues, highlighted the achievements of aces instead of improving teamwork, and neglected both analysis and tactical training (their initial training was reasonable, but refresher courses were rare)⁵⁷.

⁵⁴ *Guide for Understanding and Implementing Defense Experimentation (GUIDEx)*, Subcommittee on Non-Atomic Military Research and Development (NAMRAD), The Technical Cooperation Program (TTCP), Joint Systems Analysis (JSA) Group, Methods and Approaches for Warfighting Experimentation Action Group 12 (AG-12) (TTCP JSA AG-12), Version 1.1, February 2006. See also ‘Cycle of Research’ in the UK Ministry of Defence Wargaming Handbook (forthcoming)

⁵⁵ See Gretton (1974), P.146, and also Gene Hughson on creating a ‘learning culture’ <https://genehughson.wordpress.com/2016/12/09/learning-organizations-when-wrens-take-down-wolf-packs/#comments>

⁵⁶ Gretton (1971), P.107, see also Monsarrat (1951), pp. 374-376, Ericson pondering the challenge of mastering the new ASW tactics

⁵⁷ Atlantic War Conference (1994), Graham Rhys-Jones, ‘The German System: A Staff Perspective’, P.141 and Atlantic War Conference, Chapter 11 - Erich Topp (an ex U-boat commander), ‘Manning

The importance of training vessels in Escort Group tactics was clear to commanders of the time. As noted above, after the defeat of the wolf-pack hunting HX-239, Dönitz remarked on the convoy escorts working in ‘exemplary harmony with the specially trained support groups’ and the impact of ‘continuous air cover’ and Hessler admitted that the convoy battles of Spring 1943 had ‘shown beyond doubt that the offensive power of the U-boat was incapable of dealing with the defence’⁵⁸. Horton agreed with his opponent’s analysis, attributing the success of the Allies to ‘hard work, hard training and determination on the part of all officers and men of the surface forces and air units involved’. Gretton noted in his analysis of HX-231 that ‘training was well catered for by a tactical school run by Captain G. H. Roberts in Liverpool, where captains of ships and other officers were able to attend week-long courses and study convoy defence problems’. Gretton also commended the close collaboration with Coastal Command facilitated by Sir John Slesor in early 1943 and the combined training courses run at WATU and Maydown – an effort that increased the ratio of VLR aircraft kills from 9% of U-boat sightings to 30%⁵⁹.

The WATU case study also demonstrates how intelligence information and Red Teaming can be combined in a wargame. Roberts’ access to detailed intelligence information, Enigma decrypts and operational information enabled him to make the training wargames as realistic as possible and to conduct analytical games while the battle was in progress. Throughout the campaign, Roberts seized every opportunity to review tactics developed by veteran officers and to access notes taken from the interrogation of U-boat commanders. When technical issues arose, Roberts consulted with subject matter experts and utilised their insights to gain a deeper understanding of emerging capabilities. The combination of operational experience, operational research, access to intelligence and immersive processes enabled the WATU wargames to provide an adaptive template for combining the numerous technological advantages developed during the war into a battle-winning formula⁶⁰.

The WATU approach encouraged conceptual thinking. Roberts set an example by making the most of the talents of his remarkable team. Jean Laidlaw’s statistical tables and meticulous records of each wargame enabled Roberts and his team to coherently adjudicate each encounter and then thoroughly debrief the players after the wargames were complete. In the analytical games, her detailed plots enabled the team to identify patterns of enemy behaviour and explore opportunities to develop new approaches. These notes also facilitated the verification of WATU’s approach once the U-boat archives were made available to Roberts and his team. Laidlaw was also noted as one of the Wrens who had a talent for gaining the respect and confidence of officers much more senior than herself (she may be the model for Ericson’s gentle saviour in *The*

and Training the U-boat Fleet’, plus Gordon Williamson, *U-boat Tactics in WWII*, Osprey 2010 and Gretton (1974) is particularly scathing about the German failure to properly train their excellent submariners in tactics, pp.170-1, Haslop (2013) describes initial U-boat exercises but nothing resembling the conceptual work done at WATU and no evidence of refresher courses (P.262)

⁵⁸ Hessler (1989), Para 332

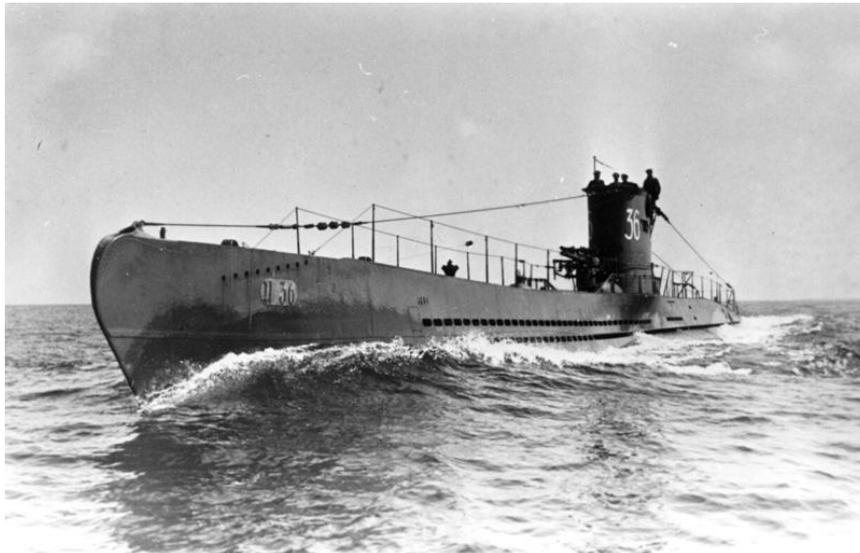
⁵⁹ Gretton (1974), P.155, P.169 and P.171

⁶⁰ S.W. Roskill, *The War at Sea: Volume II*, pp.380-1, amongst numerous useful tables and diagrams covering the campaign, Roskill includes a breakdown of the major convoy engagements between Mid-April and the end of May 1943 - showing the convoy numbers, the routes, the escorts assigned, the vessels lost, and the U-boats sunk

Cruel Sea). Barnard Rayner's organisational skills ensured that the signals and turn processes ran smoothly and 'the game' itself resembled the form and timings of the real thing. In the adversarial role, Janet Okell provided crucial insights into enemy thinking, helping Roberts to reveal the vital Red perspective that made the wargames so successful. The team also welcomed expert opinion from almost every Allied nation, consulting with experienced officers like Sir Max Horton, William Tooley-Hawkins, Pierre de Morsier, Peter Gretton and Frederic John Walker. The defeat of the Wolf-pack Leuthen would have been impossible without the officers involved knowing the kind of intelligence that the WATU team needed to develop a counter to the GNAT.

The support of senior officers was vital to WATU's success and it is notable that both Sir Percy Noble and Sir Max Horton observed wargames in progress, the latter even taking part in both 'The Game' and the course itself. Successful senior commanders in World War Two didn't hide behind their rank, they sought out the best minds at their disposal and actively encouraged the development of new tactics and technologies that could be used to counter one of the most formidable military machines in history. As Sir Max Horton noted in 1945, Roberts 'and his School of Tactics have played a far-reaching and significant part in the Battle of the Atlantic'⁶¹.

While many factors contributed to victory over the U-boats, the team at WATU enabled the Royal Navy to gain a better understanding of the threat they were facing, facilitated the development of counters to German tactics and technology, revealed weaknesses in their adversary's approach to the campaign, and disseminated what we would now call 'best practice' to every Allied commander (both air and maritime) involved in the battle⁶². By enabling every facet of the Allies' evolving ASW capability to be combined and then disseminated, the WATU wargames were one of the decisive components in the Allied victory over the U-boats.



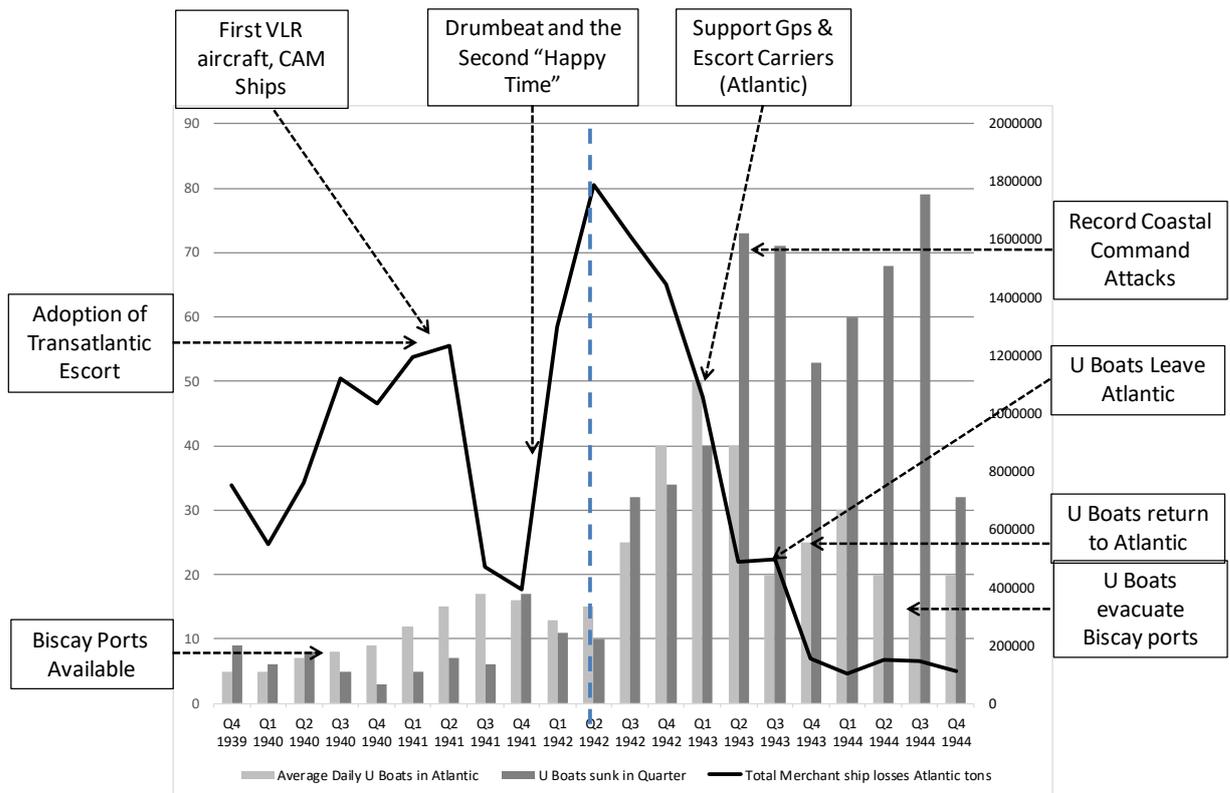
U-36 (Photo: Bundesarchiv)

⁶¹ Williams (1979), P.148

⁶² Atlantic War Conference (1994), Chapter 12 - James Goldrick, 'Work-Up', pp.227-228 and Alan Scarth, 'Liverpool as HQ and Base', P.246



A wargame in progress, showing the core team processing a turn in 1945 - Jean Laidlaw is on the left checking her notes, Bernard Raynor and Gilbert Roberts are discussing signals in the centre. The Wren at the noticeboard appears to be Janet Okell. (Photo: IWM Collection)



Graph highlighting the approximate timing of the introduction of key ASW events and technologies, including WATU (blue dashed line), and their relationship to the numbers of merchant ships and U-boats lost in the Atlantic during the campaign (Figure: Nicholas Bell)