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Wolfpack: Measure and Counter

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Intelligence, communications, and submerged speed were the critical factors in wolfpack tactics in the Battle of the Atlantic. Despite postwar technological improvements in weapons systems and sensors employed by both submarine and antisubmarine forces (which have largely offset each other), the advances in submarine design permitting greater submerged mobility and decreasing vulnerability to surface detection have made coordinated attack feasible once again.

WOLFPACK: MEASURE AND COUNTER

An article prepared

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The history of warfare affords countless examples of technological innovation followed by technological counter: axe-shield, body armor-crossbow, machinegun-tank, to name just a few. One of the more impressive sequences of innovation in warfare has been the evolution of the submarine as a destroyer of commerce and the accompanying evolution of the defense.

Historically, this process has been marked by the great rate with which changes and innovations have occurred and by the lack of any clear advantage to either side. This change has continued, and in view of the demonstrated impact of submarine war on commerce, it is natural to ask what the situation is now. Although no final answer can be provided to this question, perhaps a useful appreciation may be obtained by examining the great convoy battles of World War II and then speculating on the effects of subsequent technological improvements.

To understand the situation at the beginning of World War II, it is necessary to review briefly the lessons learned during the Great War. First and foremost, World War I saw the introduction of unrestricted submarine warfare against merchant shipping. This new technique proved capable of inflicting intense damage, direct and indirect, to the Allied war effort. On the technical side, the submarine emerged as an oceangoing vessel, capable of operating submerged for hours at a time and carrying multiple torpedoes. The defense, in addition to passive measures such as barriers and mining, had evolved the depth charge and, in ASDIC, an underwater search capability.

In the tactical realm, the greatest innovation came in 1917 with the institution of the convoy system. Although this system had been employed in earlier times, its principal utility now lay not in the strength of the escort, but in depriving the U-boat of target

contacts. In Doenitz' words, "The oceans at once became bare and empty; for long periods at a time the U-boats, operating individually, would see nothing at all . . . "[1]

Thus, in the years between World Wars I and II, the British considered that the convoy protected by ASDIC-fitted escorts provided an effective counter to the submarine menace.[2] On the other hand, the growing U-boat arm under Doenitz began to devise and exercise coordinated tactics so that many boats could "profit" from one initial target contact. Further, they contended that the escort could not cope with a coordinated U-boat attack.[3]

The early stages of World War II were marked by submarine operations conducted much as before. It was not until the Norwegian campaign had ended and the U-boats had refitted that the Germans were able to sail enough boats to try the new *Rudeltaktik*.

During the summer of 1940, U-boat command directed three group operations which failed to make contact with their targets. However, in September, the new wolfpack tactic began to produce results: in two such convoy attacks 16 merchant ships were sunk in the northwestern approaches. October produced even greater successes. Convoy SC.7 lost 17 ships to a pack of six U-boats. HX.79 lost 14 ships to four U-boats in a battle lasting 2 days, and HX.79A lost seven ships to the same four U-boats. No U-boats were lost.

Doenitz jubilantly recorded the success of his new "pack" tactics.[4] For their part, the British realized that they had been caught "unawares and unprepared."[5] In fact, Churchill later wrote in summary, "The only thing that ever really frightened me during the war was the U-boat peril."[6]

Counters to the wolfpack were introduced as rapidly as possible. These included quantitative increases, more escorts, and more aircraft. They also included new devices and capabilities: new illuminants, aircraft searchlights, aircraft and surface radar, shiphorne RDF, ahead-thrown weapons, and coordinated multiunit tactics.

Nevertheless, the victor of the Battle of the Atlantic remained undecided into 1943. In a battle lasting from 16 March to 19 March, 38 U-boats attacked HX.229, then the slower SC.122, and then both convoys as they merged. Although nearly all the U-boats suffered some damage, only one was sunk. Allied losses were 21 ships comprising 141,000 tons.

But the U-boats did not always win. The pack attacks on convoy ONS.5 began the night of 4 May and continued through the night of 6 May. Overall, 12 merchant ships and seven U-boats were sunk, five by the convoy escort. From the U-boat point of view, even worse than their losses was the fact that they had been frustrated and forced to disengage by the escort.

In spite of sporadic successes, this pattern of frustrated wolfpack attack reenrred throughout the rest of 1943. By the end of 1943 the Admiralty realized that the crisis in the convoy war had occurred during the previous spring and that they were the victor.[7, 8]

Although the U-boat remained a menace throughout the remainder of World War II, the wolfpack threat had been contained. What then had happened between the U-boat "happy time" of 1940 and the situation at the end of 1943? To answer this it is necessary to understand the conditions for a wolfpack attack to develop and to understand some of the possible means for preventing such a development.

First, the convoy must be detected and its presence reported to U-boat operational command. Although search aircraft were occasionally employed, this usually took the form of a closely (approximately 25 nautical miles) spaced line of U-boats stretched across the estimated convoy track. Reporting was done by high frequency to the

shore-based command. (Sea-based command had been tried and discarded as being sometimes difficult and in any case unnecessary.)

Secondly, the U-boats involved must be informed of the situation and given appropriate orders. This was done by frequent high frequency transmissions from Doenitz' headquarters.

Thirdly, each U-boat involved must either be "told," or must be able to determine for itself, the position of the convoy relative to its own position. Further, this information must be updated frequently. Two methods were employed to accomplish this. In the first, "absolute" geographic coordinates of the target were broadcast. However, because navigational/positional errors were apt to result in "intercept" ranges in excess of detection range, a second method was preferred. In this, a U-boat would shadow the convoy closely while emitting beacon signals for other U-boats to home on.

Fourthly, the U-boat must possess a position and/or speed advantage to enable it physically to close the convoy within the time allotted. There was no workable "standard" procedure for ensuring that a U-boat would indeed be able to close the convoy. To the extent possible, the situation was mitigated by "enlightened" prepositioning of U-boats, by allowing considerable time for closure prior to the attack, and by using the higher speed available when running on the surface. (This latter was in fact essential.)

Fifth, although not a requisite of the pack tactic, U-boat high command and the U-boats involved must maintain a "tactical picture" as the pack assembles and after the attacks begin. This was accomplished by the use of extensive high frequency and very high frequency transmissions between the parties involved.

Broadly, the development of the wolfpack attack required detection of the target (convoy), designation of the target and the U-boats to attack it, target vector information, and physical closure. Should this sequence fail, the wolfpack attack would be prevented.

The Allies recognized these facts. Considering the primary mission to be the safe delivery of cargo, they placed principal emphasis on the frustration of wolfpack attacks.[9] Counters to the U-boats were designed accordingly.

As a counter to the detection threat, evasive routing of convoys was employed. The large number of high frequency transmissions made by the U-boats when intercepted by land-based direction-finding stations provided the approximate location of U-boat concentrations. Should the convoy terminus permit, this information could be used to avoid the U-boat scouting line.

No direct attempts, such as jamming, were taken to interfere with two-way communications between the U-boats and U-boat high command. However, it was realized that intercepts of such signals could provide useful indications of impending attack. Further, it was realized that a U-boat that had been forced below periscope depth could neither transmit nor receive.

Target vector information was denied in a number of ways. In some cases, convoy routes were chosen so as to lie beyond the range of German reconnaissance aircraft. In the more common case, however, such information was denied by forcing the shadowing U-boat(s) below so that it could not transmit homing signals and so that it could not keep pace with the convoy. In accomplishing this task, shipborne high frequency direction finding proved particularly useful: not only did it indicate the presence of the transmitting U-boat, it also provided the approximate bearing.

A wide variety of methods, most of them complementary, were employed to prevent a significant number of U-boats from physically closing the convoy. Evasive routing was used to deny

U-boats a favorable position from which to initiate closure, and zigzag plans were used to complicate the approach process.

Most useful of all were the methods for denying the U-boat the advantage of his surface speed. With an economical submerged speed of 4 knots versus 12 knots on the surface,[10] a submerged U-boat stood little chance of closing unless fortunate enough to lie ahead of the convoy along its intended track. In addition to the favorable time-distance factor, a submerged U-boat would soon lose the tactical "picture" and, if sufficiently pursued, might either be dissuaded from further efforts or "killed."

Early Allied efforts to deny U-boats the surface consisted of feints by the escort and the extensive use (at night) of star shell. Subsequently, escorts were fitted with surface-search radar and radio direction-finding gear. Aircraft similarly equipped were introduced. Initially, these were available only near land, but by 1943 the escort carrier had come into use. Along with the sensors went improvements in weapons: more depth charges on escorts, ahead-thrown weapons, aircraft depth bombs, et cetera.

As the Battle for the Atlantic progressed, there was a continual increase in the quality of sensors and weapons, especially radar, and a concomitant increase in the number of vehicles available to employ them.[11] By the end of 1943 the wolfpack threat had been contained and resources became available both to defend convoys and to hunt U-boats.

Having examined the advantages of the submarine pack tactic and the means by which it was defeated in World War II, it is interesting to compare the situation then and now. In the area of weapons, current submarine and antisubmarine systems permit a "hit" with an attack error that was formerly a miss: this is achieved either through the use of nuclear explosives or of self-guiding homing weapons. Some of these weapons, rocket or jet propelled, may be employed at greatly enhanced ranges.

The performance of sensors has shown a similar improvement. Submarines now carry passive sonars that can detect suitable targets at tens of miles and so no longer rely primarily on visual detection. Aircraft are equipped with expendable sonobuoys having a similar detection capability, and escorts are fitted with powerful low frequency active sonars. Radars, high frequency direction-finding equipments, and radar intercept warning receivers have all been improved.

These changes, although impressive from a purely technological point of view, do not appear to have led to a clear advantage for either the submarine or antisubmarine sides. There is, however, one change since World War II that does not appear to have been countered: the submarine need no longer operate on the surface at all. In the case of the Snorkel-equipped diesel submarine, the principal advantage lies in the relative immunity against radar and visual detection. Generally, although

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such a submarine is not hampered by underwater endurance, it is still limited somewhat by its submerged speed.[12] The nuclear-powered submarine, when operated prudently, enjoys an even greater immunity to radar and visual detection. It is not limited by submerged speed and can run as fast, or faster, than the convoy or its escorts.

Modern technology has thus eliminated the decisive element in the defeat of the wolfpack tactic, the lack of subsurface mobility. Whether such a tactic is optimum today is moot. However, it is apparent that the coordinated submarine attack is once again feasible.

FOOTNOTES

1. Karl Doenitz, *Memoirs: Ten Years and Twenty Days* (Cleveland: World, 1959), p. 4.
2. Evidence of this belief, although circumstantial, is convincing; for example, see Donald Macintyre, *Fighting Under the Sea* (New York: Norton, 1965).
3. Doenitz.
4. *Ibid.*, p. 107.
5. Stephen W. Roskill, *The War at Sea 1939-1945* (London: H.M. Stationery Off., 1954), v. I, p. 354.
6. Sir Winston L.S. Churchill, *The Second World War: Their Finest Hour* (Boston: Houghton Mifflin, 1949), v. II, p. 598.
7. Roskill, v. II, p. 367.
8. For pertinent statistics in support of this conclusion, the reader is referred to U.S. Office of the Chief of Naval Operations, "Antisubmarine Warfare in World War II," OEG Report No. 51 (Washington, D.C.: 1946), p. 84.
9. The choice to counter the wolfpack rather than to simply "kill" the largest number of U-boats appears to have been appropriate. Although the Germans had roughly four times as many U-boats at sea from 1943 onwards as they had in 1940, the wolfpack had been beaten.
10. Doenitz, appendix I.
11. Even in the period 1940-1943, the Germans introduced counters to the Allies' counters, primarily radar intercept receivers and increased antiaircraft armament. However, they tended to lag the Allies and their major innovation, the snorkel, was introduced almost at the end of World War II.
12. Although characteristic of most operational diesel boats, underwater speed limitations can largely be eliminated through proper hull design such as employed in the U.S. Navy *Barbel* class.

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In many ways, the submarine takes the art of the guerrilla to sea. The same features prevail: stealth and concealment; ambush and evasion; anonymity and ambiguity; initiative and surprise. It is a made-to-order instrument for an enemy which has traditionally sought its victories at limited commitment and cost.

Vice Admiral John S. Thach, USN, to the Royal Australian Naval College, 27 March 1963