

研究会記録

A Hopeless Gambit? - German U-Boats in the Atlantic, 1939-43 -

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Many remember the Battle of the Atlantic as a decisive campaign of the Second World War.¹ As in the First World War, Allied strategy against Germany depended on whether Britain and the United States could maintain shipping routes across the north Atlantic: western support of the Soviet Union, the North African campaigns, and, not least, the eventual invasion of the European continent all depended on success against the U-boats. The stakes of the Atlantic war are less clear for Nazi Germany, however. The grand strategic objective of the country's megalomaniacal leader, Adolf Hitler, was the creation of a Thousand Year Reich through the conquest of living space in the east and brutal subjugation or elimination of the native peoples there. As he reiterated on many occasions, securing his westward flank need not have involved the complete subordination of Britain; indeed, he struggled with that question until December 1941, and at various turns complained that the only obstacle to a settlement was the intransigent Winston Churchill. Regardless, the struggle for the sea lanes is frequently viewed as a resounding German defeat, alternately tragic or gratifying based on how one judges the motivations of the U-boat crews.

It is difficult to escape the impression that the German navy waged an essentially hopeless war against a vastly superior foe – superior in wealth, resources, personnel, technological capacity, and especially strategic depth. And at least on an operational level, the German campaign against Allied shipping was indeed a dismal failure. But it may not have been as great a defeat for Hitler's Germany as conventional wisdom allows.

¹ The historiography of this campaign is impressively long and enthusiastic, with surprisingly little emphasis on the strategic implications of the Atlantic war. The best brief survey is Werner Rahn, "The War at Sea in the Atlantic and in the Arctic Ocean," in Horst Boog, Werner Rahn, Reinhard Stumpf, and Bernd Wegner, *Germany and the Second World War*, vol. vi, *The Global War: Widening of the Conflict into a World War and the Shift of the Initiative 1941-1943* (Oxford, 2001) 301-441; interpretively dubious, needlessly lengthy, but exhaustive are the two volumes of Clay Blair, *Hitler's U-boat War* (New York, 1996-98).

The U-boats were but one component of the German navy and air force's campaign against Allied shipping and naval assets, but even so, the scope of their accomplishment is staggering: in the course of the Second World War German U-boats sank 2828 ships totaling 14.69 million tons, very nearly the equivalent of the entire British merchant fleet as it stood at the war's outset.² But the effort also exerted a frightful toll on the U-boats and their crews. The German navy lost 785 U-boats and some 34,000 crewmen, a casualty rate of 68 percent, the highest proportion of any service arm in modern history.³

Compounding the effects of these losses were the long odds against success. The U-boats failed to achieve any of their primary operational objectives. Quite apart from actually inducing the British to negotiate a peace on Hitler's terms, they failed to cut off their shipping lifeline, prevent the gradual build-up of an American army in Europe for the invasion of the continent, or cut off the flow of western aid to Russia via the arctic convoy routes. And as losses mounted and the odds against the U-boats became almost insurmountable, their strategic prospects became less certain. As a historian put it some forty years later, "[w]hen the boats departed La Rochelle or Brest, La Pallice or Bordeaux, war and history merged into an abstract struggle for survival, almost always futile. No longer was it the 'Greater German Reich' battling the 'maritime powers,' but forty to fifty teenagers against the inexhaustible potential of half the earth. They had no idea what it was all about. They understood only the propaganda, and were driven by an obtuse desire to "get the job done."⁴

No reasonable person, surveying the wreckage in resources and lives, could doubt that the campaigns were a disappointment. But the simple facts of tonnage sunk, boats lost, and overwhelming Allied technological superiority obscure the larger significance of the struggle. Success at total warfare in the pre-nuclear age, after all, depended not only on operational successes or failures, but on the skill with which

² Lisle A. Rose, *Power at Sea* (Columbia, 2007) 280-81.

³ Timothy F. Mulligan, *Neither Sharks Nor Wolves: The Men of Nazi Germany's U-boat Arm, 1939-1945* (Annapolis, 1999) 255-61; on the crews, see also Jean Delize, *U-Boote Crews* (Paris, 2007).

⁴ Michael Salewski, *Von der Wirklichkeit des Krieges: Analysen und Kontroversen zu Buchheims "Boot"* (München, 1976) 29; on the persistent resonance of the memory of the U-boat campaigns in contemporary Germany, see, for example, Annerose und Jörg-Rüdiger Sieck, *Die U-Bootfahrer und das Ehrenmal in Moltentort: von der Kaiserzeit bis in die Gegenwart* (Neumünster, 2006).

nations mobilized their political, social, and economic systems to sustain protracted war efforts and leverage their comparative advantages. The relationship between operational and strategic outcomes is frequently ambiguous, as the Germans themselves demonstrated all too well between 1914 and 1945. Thus understood, the U-boat campaign may have been less of a failure, and perhaps even a success.

Adolf Hitler's "Directive No.1 for the Conduct of the War" of 31 August 1939 served as the foundation for German naval operations against British trade routes: "The navy will operate against merchant shipping with England as its focal point."⁵ The directive placed a campaign against shipping to the British Isles at the center of German priorities. In doing so, it corresponded with the view of the German navy on how best to defeat the British. Hitler aimed to cripple the British war economy by cutting its sea routes, thereby undermining civilian morale and driving the British government to make peace on German terms. Drawing on its experience in the First World War, the German navy believed that Britain was the chief opponent of Germany and anticipated a long war against that country, one waged primarily at sea, and which would, sooner or later, also involve the United States.⁶

The chief obstacle to German success in the war at sea lay with Hitler. Although seemingly well-disposed to the navy's focus at certain points, his overall conception of Germany's strategic interests was quite different, a fact apparent to the Navy leadership from an early point. In his public pronouncements, Hitler saw little utility in contending for naval supremacy and seemed perfectly content with a coastal navy, the better to achieve an accommodation with Britain.⁷ His ambitions, squarely in a long tradition of German strategic thinking, focused on Europe. Hitler aimed to initiate a great Aryan settlement drive to the Slavic east and build a greater Germanic empire on a racial basis, stretching from Scandinavia to the Alps in the north, and from the Atlantic to the Ural Mountains in the east.

What made Hitler's scheme more radical and extensive than those of his

⁵ *Hitlers Weisungen für die Kriegführung 1939-1945: Dokumente des Oberkommandos der Wehrmacht*, Walther Hubatsch, ed., 2nd ed (Koblenz, 1983); translated with comment by H.R.Trevor-Roper as *Hitler's War Directives 1939-1945* (London, 1964).

⁶ Philip K. Lundeberg, "The German Naval Critique of the U-Boat Campaign, 1915-1918," *Military Affairs* 27 (1963) 105-118.

⁷ Wilhelm Deist, eds., "The Rearmament of the Wehrmacht," in W. Deist, M. Messerschmidt, H.-E.Volkman, and W. Wette, eds., *Germany and the Second World War*, vol. 1, *The Build-Up of German Aggression* (Oxford, 1990) 458.

historical predecessors was nothing less than the territorial and racial restructuring of the continent through annexations, forced labor, and a pitiless racial extermination policy, to say nothing of how he envisioned the inevitable showdown with the great rival across the Atlantic. Much of this, of course, was down the road. In 1939, Hitler reckoned simply on a short campaign in Western Europe to safeguard his flank, a goal poorly served by radical economic warfare against Britain's lifelines at sea, and he would prove wary until late 1941 of intensifying the U-boat war beyond the levels needed to persuade the British to settle.

Compounding Hitler's decided ambivalence toward the Navy's strategic program was the consistent failure of that service to secure for itself an adequate share of the economy's productive resources. Regardless of how prominently the U-boat war figures in Anglo-American memory, that component of the war effort actually consumed a meager overall slice of the German war economy. Against the air force and army, the navy never managed to win more than about 15 percent of the total; more often the total hovered around 10 to 12 percent.⁸ As a result of these trends Nazi Germany began the Second World War with the weakest navy among the six major sea powers. With only 57 U-boats, it had fewer submarines than Italy (106), the U.S. (96), France (79), Japan (60), or Britain herself (62).⁹ Moreover, only 25 of the German navy's boats could be described as suitable for operations in the North Atlantic, the remainder being too small, obsolescent, or suitable only for training. Of course, one could say much the same for the submarine fleets of the other sea powers. However, the other powers could also put to sea a much larger number of other warships, and none would be compelled to depend as heavily on submarines for success in the naval war as Germany. If undersea commerce raiding was the war Hitler would wage, it was a war for which his Reich was singularly ill-prepared.

The commander of the German submarine fleet throughout the Second World War, later the commander-in-chief of the entire navy, was Karl Dönitz, an intelligent and hard-charging submarine officer from the First World War.¹⁰ That Dönitz was

⁸ J. Adam Tooze, *The Wages of Destruction: The Making and Breaking of the Nazi Economy* (New York, 2006) 251, 288.

⁹ Bernd Stegemann, "The War in the North Sea and Arctic in 1939," in K. Maier, H. Rohde, B. Stegemann, and H. Umbreit, *Germany and the Second World War*, vol. 2, *Germany's Initial Conquests in Europe* (Oxford, 1991) 156; also Michael Salewski, *Die deutsche Seekriegsleitung, 1935-1941*, iii., *Denkschriften und Lagebetrachtungen 1938-1944* (Frankfurt a.M., 1970) 297.

¹⁰ On the significance of the transition in naval leadership in 1943, see Michael Salewski, "Von

nothing short of a fanatical Nazi, inclined to place absolute loyalty to Hitler above the “preservation of the substance of the German people,” should not obscure his significance for the U-boat war for historians of the period.¹¹

Having observed how the British introduction of the convoy system in 1917 dramatically reduced the effectiveness of the U-boats against shipping, Dönitz developed in the interwar period strong views on the proper role for submarines in a future conflict. Until 1943 his influence over anything except the operational dimensions of the U-boat war was quite limited. But he worked hard to shape the doctrine and tactics of the U-boat force to maximize the potential of his few boats and have an impact on the overall war effort, most notably through the development of pack tactics. Concentrating groups of boats against convoy targets promised to parley their major shortcoming, namely their limited capacity to acquire targets in the vastness of the ocean, into an operational advantage through centralized command and control.¹²

Privately, Dönitz understood well the long odds against success in a war with Britain, at least at the beginning of the war and before an almost fanatical commitment to Hitler and the Nazis clouded his judgment. In August 1939 he calculated that Nazi Germany would require 300 modern U-boats for a successful commerce war, on the reasonable assumption that only 100 at any one moment could be on patrol. Such a number was far beyond what realistic planners at the time thought possible. Even Dönitz seemed to agree. On 4 September he declared to his staff that the war “will last a long time...and we can be satisfied if we manage to end it with a draw.”¹³

Nevertheless, Dönitz energetically resolved to mount as intensive a challenge to British shipping as he could with his limited means. But no amount of willpower and commitment could overcome the lack of a realistic strategy. Lack of boats, diversions

Raeder zu Dönitz: der Wechsel in Oberbefehl der Kriegsmarine 1943,” *Militärgeschichtliches Mitteilungen* 14 (1973); Keith Bird, *Erich Raeder: Admiral of the Third Reich* (Annapolis, 2006) 195-209; also Christian Bernadac, *La Kriegsmarine* (Paris, 1983).

¹¹ Karl Alman, *Grossadmiral Karl Dönitz: vom U-Boot-Kommandanten zum Staatsoberhaupt* (Berg am See, 1983).

¹² Rahn, “The War at Sea,” 342-5; also Hubert Jeschke, *U-Boottaktik. Zur deutsche U-Boottaktik 1900-1945*, Einzelschriften zur militärischen Geschichte der Zweiten Weltkriege 9 (Freiburg, 1972).

¹³ Mulligan, *Neither Sharks nor Wolves*, 45-6.

in other theaters and campaigns, and a growing Allied technological edge after 1942 forced him to halt operations temporarily and recast the U-boats' mission. Dönitz appears to have understood that the guiding principle at the outset may well have been "to inflict the greatest possible damage on England," but that can imply a host of approaches to how he might use his boats effectively.¹⁴

Dönitz's job throughout the war was complicated by how frequently the Naval High Command forced him to divert his few boats for purposes he viewed as pointless, such as the Norwegian invasion, support of German interests in the Mediterranean, or such mundane tasks as weather reporting or anti-invasion measures.¹⁵ To justify his need to throw every available boat against the Allies he touted the strategy of *Tonnagekrieg* – literally, tonnage war – meaning an effort at all times to sink any Allied merchant ship that could be found anywhere, full or empty, despite the tiny number of boats he had to do it. By Dönitz's calculations in May 1942, Allied losses of 400,000-700,000 tons monthly would outstrip new ship construction and bring the British to the bargaining table.

But as the historian Timothy Mulligan has pointed out, *Tonnagekrieg* represented less a coherent strategy than a domestic tactic in Dönitz's running battles with the Naval High Command for control over the allocation and deployment of his few U-boats. If losses of U-boats rose to unsustainable levels, or the Allies managed to build tonnage at a faster rate than he could sink it, then even his own justifications would melt away. In pushing for a strategy that called for the continual use of all available resources to sink tonnage faster than the Allies could replace it, Dönitz revealed the strategic bankruptcy of the German submarine war against Britain.¹⁶

The chief result of the poor funding behind the U-boat war was that in the decisive periods of spring 1942 and April 1943, when the prospects of operational success were closest, Dönitz could deploy all too few boats. There is a critical lesson here. Dönitz's readiness to prosecute the campaign casts the operational conduct of the U-boat war in a very critical light. By undertaking as intensive a war against Allied shipping in 1939 as his two dozen boats permitted, he arguably galvanized the

¹⁴ Mulligan, *Neither Sharks nor Wolves*, 55.

¹⁵ Zum Vortrag beim Führer am 26.9.1940, *Lagevorträge der Oberbefehlshaber der Kriegsmarine vor Hitler, 1939-1945* (München, 1972) 145-6; cites KTB/OKW I, 230.

¹⁶ Jochen Brennecke, *Die Wende im U-Boot-Krieg: Ursachen und Folgen, 1939-1943* (Herford, 1984).

Allies into a more serious war at sea than his force was prepared for.

Dönitz failed apparently to understand that the sea lanes represented a greater strategic vulnerability for the British than they were a strategic opportunity for the Germans. The British had to throw everything they had at the problem, whereas Nazi Germany would consistently devote but a paltry share of its resources to the naval war. As already stated, perhaps the most notable problem in the German submarine campaign was the low priority it had in the war economy of Nazi Germany, especially in its most decisive phases. Not until 1943 was the construction of U-boats accorded a high priority in economic production, as the German navy buckled under the full weight of British and American mobilization potential and technical superiority. Only at that point, after three years of promising but ultimately futile efforts, were transformative steps taken to expand the capacities of the shipbuilding industry. Stimulated by the relationship between Dönitz and the dynamic new armaments minister, Albert Speer, the German regime devoted substantially more materials, and especially manpower, to technically sophisticated new classes of U-boats – especially the Type XXI, the so-called Electroboats – that promised to realize the full potential of undersea warfare and restore the tactical initiative to the German navy.¹⁷ Speer appointed a bold industrial manager, Otto Merker, to reorganize the shipbuilding industry radically and wring greater efficiencies from an overtaxed productive base. After initial missteps, the effort yielded impressive results. Speer's program managed to design and engineer the new class of capable and sophisticated – not to say more complex and expensive – U-boats at a breakneck pace. Production increased to an impressive level by late 1944.

Of course, time had run out for Nazi Germany by that stage. The Electroboats never put to sea in appreciable numbers, and none ever fired a war shot. Moreover, it is extremely doubtful that they could have fulfilled the great expectations attached to them. Technical shortcomings notwithstanding, they did little to ameliorate the biggest problem the U-boats faced in their operations, the acquisition of convoy targets. Finally, as a fascinating study of postwar U.S. Navy planning for warfare against high-performance diesel boats makes clear, the basic elements for an effective defense

¹⁷ On the Type XXI and XXIII submarines basic to this reorientation, see Eberhard Rössler, *The U-Boat: The evolution and technical history of German submarines* (London, 1981) 208-65.

against the Electroboats were in place by 1944.¹⁸ Although the Western Allies would certainly have required a learning curve to adapt to the new threat, there can be little doubt that the competition would have ultimately ended badly for the U-boat crews and the submarine campaign. In 1943, when construction of U-boats was finally accorded a high priority in armaments production, the German navy faced the full weight of British and American mobilization potential and technical superiority. But after three years of promising but ultimately futile efforts, as significant steps were taken to expand the productive capacities of the shipbuilding industry, it was too late.

The conventional reasons for the eventual German defeat in the Atlantic campaign are well-rehearsed. Air power was arguably the most decisive single element in the struggle to control the sea lanes, and here the German navy was sorely lacking. Air support for the U-boats was at best inadequate, at worst non-existent. Throughout the war the chief of the German air force, Hermann Göring, jealously husbanded his air assets and successfully forestalled the navy's attempts to found an independent naval air arm. As a result, U-boats had little recourse in acquiring targets beyond what little third-party guidance was available and visual sighting. Submarines are small vessels with low freeboards and short conning towers. Even on clear days in calm seas, visibility in the North Atlantic extends no further than a few miles; poor weather and heavy seas restrict it even further. Radar was hardly an option: capabilities were limited and too few boats were equipped with radar early in the war. Later, Allied technical superiority in detection and localization of electronic emissions made electronic means of acquisition dangerous for the U-boats. What this meant, again, was that the most critical component of the U-boat operational profile, namely reconnaissance and convoy acquisition, was left to the U-boats themselves – a task for which they were thoroughly ill-suited.¹⁹

The Allies enjoyed superiority during the war's most critical phases in those technologies which would ultimately prove most important for the naval war. The earliest postwar assessments of Allied countermeasures emphasized the exploitation of centimetric radar technologies and intensive air surveillance as the decisive factors in

¹⁸ Owen R. Cote, Jr. *The Third Battle: Innovation in the U.S. Navy's Silent Cold War Struggle with Soviet Submarines*, Newport Paper Number Sixteen (Newport, 2003) 14-17. Note especially the identification of the convergence zone phenomenon, on the cusp of which the U.S. Navy stood during the latter stages of the Second World War.

¹⁹ Rahn, "The War at Sea," 342-5.

defeating the U-boats and keeping the sea lanes open.²⁰ Innovative and practical expedients, like sonar, hedgehog, signals direction finding, were combined with less practical, but no less innovative measures like operational research, then in its infancy as a process but nonetheless of substantial influence, and of course, with the enormously successful Allied campaign to construct merchant shipping from 1942 onwards.²¹

Over the previous thirty years especially, historians have come to see the decrypting of U-boat high-frequency signals as at least as significant as radar and air assets.²² It is easy to exaggerate the importance of radio decryption in Allied successes against the U-boats and one needs to make clear that it was not THE decisive factor, if one such can ever be identified in outcomes so complex as these. But if not decisive, it was unquestionably critical – information gleaned from the Ultra decrypts not only made the U-boats themselves vulnerable to surprise attacks, it provided British and American commanders with an important perspective into how the German navy fought the Atlantic war. On the most basic level, the Ultra decrypts had effects on the entire spectrum of convoy operations, not least by ensuring that numerous critical convoys were rerouted away from U-boat patrol lines and thereby avoided attack.

If there were reasons to doubt the efficacy of Dönitz's rationale behind the U-boat campaigns early on, the first two years of the war confirmed them. Despite impressive successes against the British trade routes early in the war, the Naval Operations Staff in July 1941 estimated that Germany would need to sink a minimum of 800,000-1 million tons of shipping monthly for an extended period before the British would be prepared to negotiate the peace that Hitler sought. When they factored American capacity into the totals after December 1941, the monthly total needed to

²⁰ Hans Meckel, "Die Funkaufklärung der deutschen U-Boote und die Rolle des xB-Dienstes (Deutscher Marine-Funkentzifferungsdienst)," in *Die Funkaufklärung und ihre Rolle im Zweiten Weltkrieg: eine internationale Tagung in Bonn-Bad Godesberg und Stuttgart vom 15.-18. November 1978*, Jürgen Rohwer and Eberhard Jäckel, eds. (Stuttgart, 1979) 121-32.

²¹ Aspects of the ASW war are dealt with in C.H. Waddington, *O.R. in World War II: Operational Research Against the U-boat* (London, 1973); Alfred Price, *Aircraft Versus Submarine: the Evolution of the Anti-submarine Aircraft, 1912 to 1980* (London and New York, 1980); Bob Whinney, *The U-boat Peril: a fight for survival* (London, 1986).

²² See the essays in David Syrett, ed., *The Battle of the Atlantic and Signals Intelligence: U-boat tracking papers, 1941-1947* (Aldershot and Burlington, 2002); and David Syrett, "Communications intelligence and the battle for Convoy OG 71, 15-23 August 1941," in Andrew Lambert, ed., *Naval History 1850-Present* (Aldershot and Burlington, 2007).

surpass Allied production skyrocketed to 1.3 million tons.²³ This figure lay far beyond what even the most optimistic proponents of the U-boat campaigns could plausibly argue was possible. More surprising was the British realization by 1942 that the country could subsist on some 26 million tons of imports per year, less than half the level of prewar imports.²⁴ The sheer fortitude of the average British citizen, along with the high priority accorded the submarine war in the Allied war effort, doomed the U-boats to failure. As the magnitude of Allied superiority became apparent especially after May 1943, Dönitz pulled his boats from the Atlantic.

The German U-boat campaigns imposed a steep cost on the Allies to keep the shipping lanes open and transit cargos safely across the Atlantic. Convoying required anywhere from a third to half again as much time for cargos to reach their destination as independent shipping. To build redundancy against lost time and actual losses, the Allies, especially the Americans, therefore found it necessary to produce far more material and ship a great deal more than was required. The need to protect convoys more effectively forced the American government in winter 1942-43 to shift production emphasis from landing craft to escort ships, severely constraining both the planning windows and strategic focus of amphibious operations. But the greatest consequences of the German U-boat effort may well have been the overall cost. Michel T. Poirier has estimated that the Allies spent nearly ten times as much on the effort to defend against the U-boats than the Germans spent to threaten the sea lanes, and this out of productive economies only four times as large.²⁵

Of course, this begs the questions of how important the Atlantic was in Allied and German strategies in the Second World War, and what benefits for other, more critical strategic theaters were foregone in order to build U-boats. The best estimates underscore that the costs of the naval war for Germany, if indeterminate, were very high, given the fact that the German economy was much smaller than those of the western Allies and that the displacement effect of resources expended in the Atlantic

²³ Rahn, "Allied Sea Transport Capacity as a Strategic Problem of the German Naval War Effort, in Boog, Rahn, Stumpf, and Wegner, *Germany and the Second World War*, vi, 326-41.

²⁴ Marc Milner, "The Battle of the Atlantic," in *Decisive campaigns of the Second World War*, John Gooch, ed. (London, 1990) 48.

²⁵ The thrust of this analysis comes from Michel Thomas Poirier, *Results of the German and Submarine Campaigns of World War II*, Chief of Naval Operations, Submarine Warfare Division, 20 October 1999; Poirier's study is an excellent, if dated, analysis of the basic disparity between sea-control and sea-denial strategies.

theater were consequently more pronounced. This is especially evident when one considers how valuable a productive commodity were the tens of thousands of highly-skilled shipyard workers who built the U-boats, and what other ends they and the materials resources in question could have served. As should be clear, no amount of success in the Atlantic was likely to yield a victory for Nazi Germany in the only theater that really counted, the Eastern Front. For the Allies - especially the British - access to the sea lanes was a question of life or death. Direct comparisons between the Allied and German war efforts are therefore meaningless; only a metric that manages somehow to capture the comparative importance of the Atlantic Theater will produce a precise ratio of costs to benefits for each side. But the larger lesson for modern naval history is certainly borne out by the basic facts: the costs of sea access are much greater than the costs of sea denial, and smaller, weaker naval powers can exact a frightful toll on their larger opponents at a marginal expense.

How should historians today view the U-boat campaigns of the Second World War? If the U-boat service stood little or no prospect of sinking enough tonnage to cut off Britain and drive her leaders to the peace table, how could one justify the resources devoted to that end? U-boats cost a great deal, absorbed enormous quantities of steel, copper, and fuel, and required a huge construction base in skilled industrial manpower, undoubtedly the most critical factor input in the German war economy. Given the imperative of success on the Eastern Front for strategic victory in the war, one could argue that Nazi Germany might have done well not to have built any U-boats. The regime might have more prudently directed those resources towards the fighting vehicles, artillery, aircraft, and munitions essential to success in the East. This is not to overlook, of course, the far more wasteful construction and manning of large surface units, which had a minimal impact on German success in the most critical theaters of the conflict. Should the historian not argue that Nazi Germany ought to have constructed only those limited and smaller-scale vessels, and especially aircraft, necessary to safeguard the coastline and defend the Baltic?

Not necessarily. The costs of sea control, and the access dependent on it, have almost always outweighed the costs of sea denial. In the case of the U-boat campaigns, the costs to Nazi Germany of attacking the sea-lanes to Britain exacted a meaningful toll on the Allied powers. The critical question is where that critical break-even point for Nazi Germany lay. What number of boats and invested resources

brought about a sufficiently expensive reaction on the part of the Allies without representing too great a drain on German resources and personnel? Anecdotally, and overlooking the specifics involved, it seems reasonable to suggest that a wise strategic alternative to the course pursued might have been a campaign against British shipping routes measured not by tonnage sunk, but by the amount of resources and time devoted by the Allies to dealing with the problem. The German navy would probably have sunk a lesser number of ships, to be sure, and the amount of Allied resources devoted to the menace would probably have been less, but neither would it have been as costly to Germany in critical resources and personnel. The viability of this option depended not on the prospect of German operational victory, but on the more nuanced balance sheet of costs incurred and imposed.

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