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Wolves Without Teeth: The German Torpedo Crisis in World War Two

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WOLVES WITHOUT TEETH:
THE GERMAN TORPEDO CRISIS IN WORLD WAR TWO

by

David Habersham Wright

(Under the Direction of Charles Thomas)

Abstract

The “Torpedo Crisis,” or “*Torpedokrise*” as referred to by the Germans, is the name given to the period of the first few years during the Second World War during which time the German U-boat arm experienced catastrophic technical malfunctions with their torpedoes. These malfunctions robbed the Germans of tremendous success during the most critical period of the Second World War – the opening years during which Allied anti-submarine measures were at their poorest and German prospects for success concomitantly at their greatest. By the time the Germans finally succeeded in removing all of these problems and realized the true potential of the torpedo envisioned during the prewar years, Allied anti-submarine warfare tactics and especially technology had advanced to such a degree that it could not be overcome despite the best efforts of the *U-bootwaffe*. Seen through this light, the Torpedo Crisis assumes great importance as being a significant obstacle that slowed the German march to potential victory and thus perhaps buying the Allied additional time to perfect their methods of combating the U-boat menace.

Using the war diaries of U-boat commander-in-chief Karl Dönitz and different U-boat commanders, as well as select microfilm records of the German Naval High Command and various secondary sources, I attempt in this study to reconstruct the story of the torpedo crisis and the events that caused it, in the hope of raising the reader’s awareness of this crucial yet little known chapter of the Battle of the Atlantic.

INDEX WORDS: Torpedokrise, Torpedo Crisis, U-boat, Torpedo, Torpedo Inspectorate, Oskar Wehr, U-Bootwaffe

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by

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DEDICATION

To my parents, who at a very young age gave me a deep appreciation and love of history and without whose support and encouragement I would never have the opportunity to write this, let alone graduate.

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PROLOGUE

It was a calm and cloudy October afternoon as U-47 slid out of her berth at Kiel.¹ Standing on the conning tower next to his first watch officer, the boat's captain, *Kapitänleutnant* Günther Prien, took a last look at the numerous ships, piers, cranes, workshops, and storage buildings that formed the landscape of the Reich's premiere naval base, before turning his attention to the sea and the difficult task that lay before him. To the eyes of the crowd that invariably gathered like clockwork on the pier to watch the departure of one of the Reich's famous "Grey Wolves," U-47 was setting out on a patrol presumably like any other. She would doubtless go out into the North Atlantic somewhere and hopefully sink a few plump merchantmen and then return home either to Kiel or Wilhelmshaven where the adulating crowd would once again crowd the piers, flags waving and band playing, to welcome the heroes home. Only Prien, his officers, and a few select others in the Reich knew that this was no ordinary patrol and that the very nature of this mission, certainly the most daring ever attempted by the *Kriegsmarine* to date, would either make the men aboard U-47 instant celebrities or, perhaps more likely, merely the newest set of martyrs to perish for the Fatherland.

At first glance, U-47's mission seemed so unreasonable, so dangerous – some might even say ludicrous – that as he gazed back at the now thinning crowd of well wishers gathered on the distant pier, Prien may well have wondered whether anyone would have believed his intentions had he made them known. All he had to do was successfully guide his boat undetected into Scapa Flow, the principal home of the Royal Navy, do what damage he could, and then get out

¹ Günther Prien, U-47 KTB, 8.10.1939, PG 30044/1-11, National Archives Microfilm Publication T1022 series, Roll 2970

again, preferably in one piece. Although simple enough in objective, in practice it was anything but. The Flow was accessible only by a few key entrances, over which the British had in the years before the war towed and then sunk several large barges known as block ships. Inside the actual harbor, as well as in its approaches, there flowed powerful and unpredictable currents capable of throwing U-47 or any other unfamiliar vessel off course and into the block ships or surrounding rocks. During the previous war, before the U-boat defenses had been in place, Scapa Flow had been the end of two other boats. In 1914 U-18 had managed the treacherous currents only to be rammed and sunk by a trawler upon entrance. In his approach four years later *Oberleutnant* Joachim Emsmann in UB-116 had been detected by hydrophones and destroyed by shore detonated mines with a loss of all hands.

As might be expected, U-47's approach was not easy. In the darkness of night Prien was led astray by the sight of a half sunken wreck, which he took to be one of the blockships guarding the entrance to Kirk Sound – his intended route into the harbor – but which in actuality denoted the far more hazardous Skerry Sound. As U-47 slid into the Skerry Sound, she was immediately grasped by one of the aforementioned currents, which threw the boat into the nearby shallows where she temporarily ran aground. Thanks to the efforts of the boat's chief engineering officer, *Oberleutnant* Johann-Friedrich Wessels, U-47 managed to free herself from the sandy bed and, with the engines running full speed, was able to struggle against the current back to the entrance of the Kirk Sound. Prien's ill luck continued. Once in the correct passage, U-47 again ran aground, this time on the anchor cable of one of the block ships, but was soon able to free herself after Prien ordered all the ballast tanks blown. To make matters worse, once having passed the last of the block ships and upon entering the harbor at midnight, U-47's

conning tower was suddenly illuminated by the headlights of a passing car, which came to a stop, turned around, and sped off back in the direction of Scapa Flow.²

Unlikely as it seems, it would appear as if the driver of the car had in fact not spotted them, or else had neglected to report the matter, for no alarm sounded as U-47 cruised into Scapa Flow. Indeed, the most pressing problem was not detection, but rather the lack of targets present. Though Prien could not have known it, in response to the heavy *Luftwaffe* reconnaissance of the harbor in the days preceding the foray, the bulk of the Home Fleet had been removed from Scapa Flow and sent to Norway the day before, which was thought to be safer from future *Luftwaffe* incursions. Accordingly Prien spent the next thirty minutes wandering aimlessly around the harbor, looking for targets. Just as the crew was beginning to suspect that the entire mission might be a failure, the boat's First Watch Officer (I-WO), *Oberleutnant zur See* Engelbert Endrass, reported two large shapes roughly 4,000 meters ahead of them. These shapes, which Prien mistakenly took to be the two warships *Royal Oak* and *Repulse*, were actually the battleship *Royal Oak* and the 6,900 ton seaplane transport *Pegasus*.

Prien immediately ordered an attack. Estimating the distance at 3,000 meters, and setting the running depth for the torpedo at 7.5 meters, Prien plugged the coordinates into the *Vorhaltsrechner*, the boat's fire control system. He and his superior, Karl Dönitz, had already decided that U-47 would carry only the G7e electric torpedo, which although slower than the other type, the G7a air torpedo, had the advantage of leaving no telltale wake that might alert the English to the boat's presence. Prien planned to fire two of his four shot spread at the front ship, and the other two at the rear one. At 0058 hours he gave the order to fire. Only three of the four torpedoes left their tubes, however, owing to a failure of the firing mechanism on tube four. In the attack room Prien's second officer, *Oberleutnant zur See* Amelung von Varendorff, set his

² U-47.org, "Scapa Flow," page 2, http://www.u47.org/english/u47_sca.asp?page=2 (accessed March 22, 2010)

stopwatch and counted off the seconds. After three and a half minutes one of the torpedoes struck *Royal Oak* on her starboard bow, though the resulting disturbance, which was attributed to internal causes, was so inconsequential that most of *Royal Oak's* crew simply returned to sleep after being roused. The other two torpedoes veered sharply off course, and nothing more was heard of them. While the torpedo crew worked to reload the bow tubes and correct the faulty torpedo in tube four, Prien swung the boat around to try a shot with the stern torpedo, which also missed.³

Needless to say, these first two salvos had been a definite disappointment for the Germans. Three torpedoes had missed or malfunctioned, while the one success had seemingly resulted in such little damage as to elicit no activity from the British. With three of his bow tubes by now reloaded, Prien decided to swing back around for another salvo, which would be aimed at the *Royal Oak*. With the distance by now only 1,500 meters, Prien gave the order to fire at 0123 hours. Again von Varendorff ticked off the seconds on his stopwatch. One hundred and eighty seconds later a huge explosion rocked the British ship, columns of water rising up against her side as men and debris were flung high into the air.⁴

If Prien had been slightly miffed that his first attack had gone unnoticed, he was not disappointed by the results of the second. All around U-47 the harbor sprang to life. Signal lights flashed around the boat while on the shore cars sped down the road at top speed. Numerous searchlights were flipped on, though fortunately for the men on U-47 they were all aimed towards the sky, searching in vain for the German aircraft which the British thought had to be the culprit. Though he still had five torpedoes remaining, Prien determined that if he was ever

³ *ibid.*, 3

⁴ Günther Prien, U-47 KTB, 14.10.1939, PG 30044/1-11, National Archives Microfilm Publication T1022 series, Roll 2970

going to escape the harbor the time to do so was now, as the chaos he had caused would hinder an organized response. Besides, it was far too bright to attempt any further tactical maneuvering.

The tale of U-47's escape was just as eventful as her entrance. The changing tide prevented U-47 from exiting the harbor the same way she had come in. Instead she had to slip out through the narrow southern channel between the blockship *Minich* and the coast of the islet of Lamb Holm. Fighting against a ten knot current, U-47 again had to maneuver past the rusted hulks of the blockships, as well as an unidentified vessel which Prien later claimed was a destroyer that temporarily gave chase, signaling them in Morse code before suddenly turning away.⁵ With skillful maneuvering on the part of the boat's helmsman, *Obersteuermann* Wilhelm Spahr, U-47 evaded these obstacles and before long was back on the open waters of the North Atlantic, heading home to Wilhelmshaven and to a hero's welcome.

As might be expected, during the numerous parties and celebrations that followed, the issue of U-47's torpedo failures never seemed to find their way into the general accounts, despite being clearly mentioned in the boat's war log. Considering the jubilant mood of the time, such an omission is certainly understandable. Nevertheless, as Cajus Bekker points out in his account of the period, the fact of the matter was that "Prien had been obliged to fire off seven torpedoes before two of them at last scored hits – and that at a stationary target lying at anchor."⁶ Needless to say, of the five torpedoes that missed nothing was ever heard, yet an examination of these misses yields a frightening conclusion. It is unlikely that these torpedoes simply missed their target, for if that was the case, given the range and the confined environment in which they were shooting, any misses would simply have gone past *Royal Oak* or *Pegasus* and detonated

⁵ U47.org, "Scapa Flow" page 3, http://www.u47.org/english/u47_sca.asp?page=3 (accessed June 16, 2010)

⁶ Cajus Bekker, *Hitler's Naval War* (London: Macdonald & Jane's, 1974), 119

somewhere against the rocky shore.⁷ The fact that they did not, having for all intents and purposes simply vanished, suggests only one thing; of the first four torpedoes that Prien had fired (not counting the one that refused to leave its tube), three of them had been duds. However many of the second salvo also proved to be failures cannot be told, as against the tremendous explosion of *Royal Oak* it was impossible to distinguish the number of detonations. More likely than not, assuming they ran the same direction as the torpedo that sealed *Royal Oak's* fate, the other two torpedoes would have been detonated by the blast of the first. In any event, the conclusion here is obvious. Prien's success at Scapa Flow, certainly one of the finest moments in German naval history, came close to being a failure, not because of the defensive measures of the British, but as a result of the Germans' own defective weapon. Moreover, the same problem that impeded Prien's attack at Scapa Flow would reappear again and again throughout the course of the Battle of the Atlantic, with serious and oftentimes tragic results for the men of the German *U-Bootwaffe*.

⁷ *ibid.*, 120

INTRODUCTION

The story of the persistent torpedo failures suffered by German U-boats in the initial years of World War II is a prime example of the type of history which tends to be ignored in the popular studies of the era, but which played just as important a role in the eventual outcome of the struggle as did tactical decisions by the combatants themselves. Although the German *U-Bootwaffe* has continued to generate tremendous interest as the subject of books and movies, it is an interest that is almost exclusively concerned with the operational side of things, such as daring raids against impossible odds or the epic convoy battles of 1942 and 1943. In such stories, when assessing the potential for success or failure of a particular attack, the personality of the captain – his experience and daring – and the experience of the rest of the crew normally jump to the forefront as prime indicators. But, as will be shown by this study, in actuality the success or failure of any given attack could also be determined by factors entirely outside the capacity of the captain or the crew. In the aforementioned case of the U-47 and the *Royal Oak*, the most seasoned and expert commander and crew of the period came perilously close to failure due to circumstances – torpedo failures – entirely outside the control of the human element on board. In other words, at that exact moment, all of Prien's tactical skill and expertise as a commander counted for absolutely nothing, and the success or failure of this astonishing achievement rested entirely on the behavior of his torpedoes. Because at least one of the weapons finally worked, the operation was a success, and Prien and U-47 were assured of their place in history. The results could just as easily have been very different.

The public hoopla that surrounded Prien's accomplishment is indicative of the treatment given to the Battle of the Atlantic and the German *U-Bootwaffe* as a whole. Although the U-boats ultimately were defeated, they achieved spectacular success (at least in the first few years), and the conduct and sacrifice of their crews became one of the few bright spots in an era where the reputation of German arms as a whole was severely tainted by the darkness of National Socialism. A popular postwar legend of German supremacy in submarine warfare and all matters related to it – including weaponry – has grown out of the exploits and wartime success of the “Gray Wolves” that in the minds of many nearly carried the war for Germany. The idea of German infallibility in matters of the submarine has been furthered by the contemporary statements of their former adversaries. Chester Nimitz stated in an affidavit presented in defense of Karl Dönitz at the Nuremberg trials that the American Navy used the German practice of unrestricted submarine warfare from day one in the successful submarine offensive against Japan.⁸ Moreover, many persons with even a passing interest in World War Two are often acquainted with Winston Churchill's statement that the only thing that really frightened him during the war was the U-boat peril.⁹

A brief look at some statistics of Allied shipping losses during the war, which admittedly vary somewhat between authors, depending on whether or not they choose to include in their tally those ships that fell victim to submarine-laid mine fields as well as those sunk directly by torpedoes or gunfire, would seem to lend credence to Churchill's wartime fears. For instance, in roughly the first three years of war, from September 1939 through August 1942, Clay Blair cites a total of 1,904 ships sunk by both German and Italian submarines (the Italian contribution being

⁸ Peter Padfield, *Dönitz: The Last Führer* (London: Cassell & Co, 2001), 463-464

⁹ Winston S. Churchill, *The Second World War, Volume Two: Their Finest Hour* (Boston: Houghton Mifflin, 1985), 259

minimal), for a total loss of 9,235,113 tons.¹⁰ Robert Albion and Jennie Pope for their part put total shipping losses over the course of the entire war at 2,828 vessels for 14,687,000 tons.¹¹ These statistics, whatever their totals, reflect a tremendous amount of Allied shipping and, by extension, human lives lost. Yet these figures could easily have been worse for the Allies or correspondingly better for the Axis. For much of the war, the *U-Bootwaffe* fought its enemies “with a wooden sword,” as Prien later so succinctly put it.¹² German torpedoes failed again and again, to the point that it might be said that these same gray wolves which had so mercilessly decimated the Allied flock for the first four years of war had done so with a quarter of their teeth missing.

In this thesis I will explore the issue of torpedo failures within the *U-Bootwaffe* during the first few years of war, a phenomenon that has come to be known simply as the *Torpedokrise*, or Torpedo Crisis. A strong argument could be made that the *Torpedokrise* constitutes to date the single greatest catastrophe in the relatively short history of the German Navy. Indeed, in its most simplified role, the *raison d'être* of the U-boat is to convey its crew by stealth to a favorable position from which they might fire a torpedo. If the torpedo malfunctions or otherwise fails to work properly, the U-boat loses all its value as an instrument of combat.

More than anything, the *Torpedokrise* was particularly devastating to the U-boats' chances for victory because of the time period over which it took place. As is abundantly clear from a quick glance at any graph or set of statistics, any prospect that the U-boats had of defeating England had to come within a certain window. As might be expected, Allied Anti-Submarine Warfare (ASW) measures were at their weakest during the initial years of war and

¹⁰ Clay Blair, *Hitler's U-Boat War: The Hunters 1939-1942* (New York: Random House, 1996), 771

¹¹ Robert Greenhalgh Albion and Jennie Barnes Pope, *Sea Lanes in Wartime: The American Experience* (Hamden, CT: Archon Books, 1968), 347

¹² Franz Kurowski, “Die Torpedokrise in der U-Boot-Waffe,” *Deutsches Soldatenjahrbuch* Vol. 36 (1988): 366

gradually improved as time went on. From the start of the war until May 1943, the month which the Germans would come to call “Black May,” the exchange ratio of Allied ships sunk per U-boat lost held within tolerable limits for the Germans. Moreover, just two months earlier, the tonnage sunk by Dönitz’ U-boats again began to outpace the rate at which it was built. During the first twenty days of March 1943 alone, for instance, the U-boats sank a total of ninety-seven Allied ships – roughly twice the rate that they could be replaced – while losing only seven of their own number.¹³ As a Royal Navy report later concluded, “The Germans never came so near to disrupting communications between the New World and the Old as in the first twenty days of March 1943.”¹⁴ Then, for a number of reasons that are outside the scope of this study, the U-boat war suddenly came crashing down in May, 1943, with forty-one boats destroyed, a number that corresponded to roughly 41 percent of the operational U-boat force. Things only got worse from that point onwards, and the losses in tonnage the *U-boats* were able to inflict never came close to keeping pace with Allied production. The German bolt had clearly been shot by May 1943.

As will be seen, German torpedoes suffered from a variety of issues, and fixing them was a step-by-step process accomplished over a long period of time. While the most serious defects were removed by early 1942, other problems lingered on and would not be remedied until the introduction of the Pi 2 and TZ5 magnetic torpedo pistols in early 1943, just before the onset of Black May. In other words, the period of torpedo failures coincided with the window of opportunity which the U-boats had to achieve a decisive victory. The tragedy of this from the German side is that when Allied ASW measures were at their weakest and German prospects for

¹³ Michael Gannon, *Operation Drumbeat: The Dramatic True Story of Germany’s First U-Boat Attacks Along the American Coast in World War II* (New York, NY: Harper & Row Publishers, 1990), 395-396

¹⁴ Stephen Roskill, *The War at Sea 1939-1945, Vol. II* (Uckfield, East Sussex, United Kingdom, Naval & Military Press, 1956), 375

success concurrently greatest, the torpedoes were at their worst. When the torpedoes were at their best, the window of opportunity was over.

This study begins with a basic introduction of the two primary types of German torpedoes used during the Second World War, the G7a and the G7e series. This first section contains basic information, such as the numbering systems, measurements, and the development of the two torpedoes during the interwar years. It also includes a basic explanation of the five crucial components of the torpedoes – the propulsion system, the guidance system, the warhead, the pistol, and the depth-keeping mechanism– as well as production figures, torpedo maintenance procedures, and the fire control system.

The main portion of the study is the chronological history of the *Torpedokrise*, from the start of the war in September 1939 to the remedying of the last major defects with the introduction of a successful magnetic detonation pistol, the Pi2, and especially the TZ5, which was used in the new *Zaunkönig* (Wren) homing torpedoes, which were first produced in late 1942 and entered service in 1943. While the actual term *Torpedokrise* is most commonly used by authors only in reference to the disastrous performance of German U-boats during the invasion of Norway and the period immediately after, for the purposes of this study, which deals with torpedo failures in general, I use the term to refer to all the years in which torpedo failures were a factor. I have broken the chronological history up as follows: the period from the beginning of the war up to the invasion of Norway; the performance of the boats during Operation *Weserübung* and the changes within the *U-Bootwaffe* that resulted from this event; the decision to resume warfare in the Atlantic and the dawn of the first and second “Happy Times” periods (May-December 1940 and January-August 1942); and the discovery and removal of the final difficulties with the torpedoes.

The next section is analytical. First I trace the sequence of events in the pre-war years that led to the poor state of the torpedo by the outbreak of war and attempt to assess the inner-war policies of the *Torpedowaffe* insofar as they would be helpful or harmful to the production of a reliable torpedo. In addition, I analyze several different factors which abetted the torpedo crisis, such as the various administrative organs of the torpedo department and their shortcomings, the faulty methods of conducting torpedo trials and what I perceive as the corresponding poor standards of the German Navy in evaluating torpedo exercises. Finally, I attempt to ascertain the degrees of guilt of the various persons and parties associated with the *Torpedokrise*.

The last section is an examination of certain non-technical factors that might account for at least some of the torpedo failures and so strengthen the argument posed by some, notably Heinz Trompelt, which portrays the *Torpedokrise* as being more the result of human shortcomings than of a fundamental weakness in design and production.

Chapter 1

The Development of the G7a and G7e Torpedo

At the outbreak of war in September 1939, the German *Kriegsmarine* (Navy) possessed two standard types of torpedoes, the steam powered G7a and the electric powered G7e.¹⁵ Both were quite heavy; each G7a displaced 3,369 lbs dead weight, while the G7e was slightly heavier at 3,534 lbs dead weight. Externally, the two types looked identical. Each was 23.5 feet long (7.16 meters), and each was 21 inches in diameter. This parity of measurement allowed each to be fired from the same standard torpedo tube found aboard the typical German U-boat. Internally they were quite similar as well. Both contained the same warhead, were governed by the same depth keeping device (the *Tiefenapparat* or “depth device”), and were detonated using the same ignition system, referred to as a “Pistol.” The difference was that as the G7a was propelled by a gas-steam engine, which had the disadvantage when fired of producing a tell-tale bubble wake which could be spotted on the surface during the day. Hence its use was relegated to night or long-range attacks. As the electric powered variant, the G7e had the big advantage of leaving no visible wake, although it was considerably slower and did not have the range of the G7a.

German torpedoes were designated by the letter “T”, followed by a roman numeral (for example, the *T I*, *T II*, *T III*, *etc*), and occasionally by a letter suffix (example *T IIIb*). In addition to this they were classified by a three character sequence, such as G7a or G7e. Every German torpedo of the Second World War used the letter G, followed by a number which indicated its

¹⁵Throughout this study, my major source for information regarding the technical aspects of German torpedoes is Eberhard Rössler’s *Die Torpedos der Deutschen U-Boote* (Hamburg, Berlin, Bonn: Verlag E.S. Mittler & Sohn 2005).

length (seven meters), and a letter which stood for its method of propulsion (a = steam [*abgass*], e = electric). Eventually, a torpedo might be given a code name, such as the *Wren*, or *Falke*.¹⁶

The types of torpedoes under consideration in this study were the G7a T I and the G7e T III.

Although the G7a was basically a further improvement of the technologies of the older G6, G7 and Whitehead G/250 series of the First World War, both it and the technologically superior G7e underwent considerable advancement during the interwar years, albeit under very different conditions. This development had to proceed in secret, however, as the terms of the Treaty of Versailles under Section 192, prohibited Germany from manufacturing any torpedoes as well as U-boats.

While the Versailles treaty may have prohibited the Germans from constructing new torpedoes, little was said about what was to be done with the stocks leftover from the war. Therefore, for the development of what would become the T1, it was simply a matter of improving those torpedoes already in existence. To this end in the summer of 1919 the German *Marineleitung* ordered the establishment at Eckernförde of the *Torpedo-Versuchsanstalt* (Torpedo Testing Institute), abbreviated TVA, for the purpose of testing and restoring these torpedoes to their original condition.¹⁷

The first step was to increase the old G7's top speed from thirty-five to forty knots while eliminating the disturbances exhibited by the torpedo during its acceleration phase, which had hitherto prevented the torpedo from achieving optimum speed. To this end the total power was nearly doubled from 120 PS to 238 PS (PS = *Pferdestärke* or horsepower). In addition, the outer form of the torpedo was given a makeover to decrease resistance, leading to the new designation

¹⁶ David Miller, *U-Boats: The Illustrated History of the Raiders of the Deep* (United Kingdom: Pegasus Publishing Ltd. 2000), 86-87

Uboataces.com, "Torpedoes," <http://www.uboataces.com/weapon-torpedo.shtml> (accessed March 28, 2010)

¹⁷ Rössler, *Die Torpedos der deutschen U-Boote*, 51

G7s. The torpedo was also made more economical by a transition from sliding to valve steering, while additional power was added by improving the boiler, which resulted in an increased level of atmospheric pressure to 200 atu. These changes, which were far more complex than this incredibly brief description would indicate, earned the torpedo yet another new designation of the G7v*.

At the same time of these improvements, work on another twenty-one inch torpedo type was being carried out. This new type, designated the G7a, was very similar to the G7v with the exception of having a larger and presumably more robust power plant. It was actually being built by Germany on behalf of the Spanish industrialist Horacio Echevarrieta, who happened to own a shipyard at Cadiz from where he was eager to produce German designed submarines and torpedoes. The deal never materialized, however, due to the eventual bankruptcy of Echevarrieta, but as the torpedoes were already being produced by the TVA, it was decided to simply keep them as the new standard German torpedo. As mentioned before, the basic design of the G7v was maintained, but with a few alterations. The stroke volume was enlarged from 3.8 to 5.4l, and the rate of spin of the propellers was slightly increased, which further increased the power to 320 horsepower. Further modifications not relating to the power plant consisted of increasing the payload of the warhead, equipping it with the new Pi G7a pistol and the new *Geradelaufapparat* (guidance system) GA VIII, a new arrangement of the depth-keeping device, and the use of a Whitehead tailpiece.¹⁸

The development path of the G7e differed dramatically from that of the G7a. While it is true that some experimental work had been done by Siemens and AFA (*Accumulatoren-Fabrik Aktiengesellschaft*) on an “E Torpedo,” or “Eto” as this type eventually became known, the concept was still very much in the developmental stage so that by the end of the First World War

¹⁸ Ibid., 51-54

there existed no readily available stocks of manufactured torpedoes from which to conduct future trials, unlike the case of the G7a. This meant that if Siemens wanted to move anywhere past the design stage with the Eto and actually begin production, it would have to be done somewhere outside Germany.

This was actually a very common practice during the Weimar period. The Navy, anxious to preserve their submarine knowledge, chose to circumvent the restrictions of the Versailles treaty by “establishing a network of quasi-civilian companies, which carried out work for foreign navies, but always with the aim of furthering Germany’s own expertise and ambitions.”¹⁹ The two most important of these organizations was *Mentor Bilanz* (later renamed *Ingenieurbüro für Wirtschaft und Technik GmbH* – Engineer Bureau for Economic and Technical Matters – abbreviated as *Igewit*) and *NV Ingenieurskantoor voor Scheepsbouw* – Engineer Office for Shipbuilding, which was commonly referred to as IvS and based in the Netherlands. *Mentor Bilanz* served the purpose of finding foreign customers for whom German designs could be built, while IvS, which was composed of the traditional German shipyards AG Vulcan, AG Weser, and Germaniawerft and staffed by their personnel, had the role of building and testing these designs. Work was therefore conducted both in Germany and in the Netherlands. The planning and design work was done in the aforementioned shipyards located in Germany, while actual construction of these designs proceeded in the Netherlands. Both of these organizations were in addition funded in secret by the German *Reichsmarine*. To restate, during the interwar years Germany searched for customers willing to purchase their designs for submarines and torpedoes,

¹⁹ Miller, 16

which would then be built for these countries either at their own yards or at German yards located abroad, but always under the close supervision of German naval officials.²⁰

Such was the course taken by Siemens in regards to the Eto. Siemens offered foreign suitors licensing rights to produce the torpedo themselves, although under German supervision of course. At a meeting on December 20, 1922, between the firms participating in the construction of the E torpedo, namely Siemens, AFA, and Pintsch, it was decided to establish a factory outside of Germany where the E torpedo could be produced and tested. Not surprisingly, Spain was initially chosen as the site of the factory, due in no small part to Echevarrieta, whose ambitious submarine building scheme coincided perfectly with the desire of the *Marineleitung*. Negotiations with Echevarrieta were handled by none other than Wilhelm Canaris, the future head of the German intelligence network, the *Abwehr*, and who, incidentally, was later executed in 1945 by the Nazi state for his role in the German resistance. On January 26, 1926, Echevarrieta signed a ten year contract with the *Marineleitung* for the establishment of a torpedo factory in Cadiz, agreeing to appoint a German national as manager and make available to the *Marineleitung* all materials relating to tests and observations. German experts were to be involved in all stages of the production and testing, and Echevarrieta further agreed that these German-designed torpedoes would be supplied only to the German and Spanish navies.²¹ Unfortunately the plans for the torpedo factory never materialized. Radical political change ousted the regime of the Spanish dictator Miguel Primo de Rivera in 1930, and in the midst of the resulting chaos and economic uncertainty the many grandiose plans that highlighted German-Spanish cooperation were set aside or scrapped.

²⁰ Ibid., 16-17. Eberhard Rössler, *The U-Boat: The Evolution and Technical History of German Submarines* (London: Cassell & Co. 2001), 88-89

²¹ Michael Mueller, *Canaris: the Life and Death of Hitler's Spymaster*. (Annapolis, MD: Naval Institute Press. 2007), 68

With the collapse of the Spanish deal the main player in German torpedo planning became Sweden, a country that along with Spain had initially shown interest in the German proposal. For some time, however, the Swedes had proved themselves to be remarkably difficult customers. On October 18, 1923, a contract proposal had been drawn up by AFA director Dr. Müller in which Germany would deliver plans for the Eto and one G7 series torpedo to Sweden in exchange for a certain amount to be paid upon receipt plus additional licensing costs, as well as a pledge from Sweden to not share these plans with either England, France, Belgium, or the United States. The Swedes had rejected this offer on the grounds that the payment was considered too high. Sweden was later able to exact an extraordinarily favorable agreement from the Germans, whose current political situation left them poorly placed to negotiate. The Germans undertook to deliver to the Swedes all information and plans for the Eto free of charge and also gave the Swedes permission to manufacture several of the important Eto parts in Sweden. These plans were delivered in July 1925, but actual production was delayed until 1929 due to further negotiations by the Germans, who were determined that at least some of the components should be manufactured by German firms. By September 5, 1929, these obstacles had been overcome, and Eto production was finally begun at the torpedo factory at Karlskrona.²²

Initial tests with the Eto revealed no complaints, and in 1932 the TVA began manufacturing a very small number for study in Germany. The torpedo, now given the permanent designation G7e, was chosen to be the primary weapon of new U-boat arm over the G7a because of its lack of a tell-tale bubble wake, which the Navy considered sufficient enough to compensate for its lack of speed and range. It was not, however, deemed a suitable torpedo for use in practice shoots, for which the G7a was used, as the massive battery of the G7e made the torpedo exceedingly cumbersome to replace and recharge. In addition the battery itself had a

²² Rössler, *Die Torpedos der deutschen U-Boote*, 65-66

limited lifespan, which the Navy did not want to use up on practice shoots. In mid August 1934, Firma Pintsch was awarded a construction contract to manufacture the G7a within Germany, and full scale building was begun so that the torpedoes might be ready when the first of the new U-boats began rolling off the slipways in 1935.²³

As a final comment to the development of the G7e, it is worthwhile to mention that the Germans were very successful in keeping the entire project hidden from the knowledge of the Allies – a very impressive feat considering that the restrictions imposed on the Germans by the Versailles treaty required the surrendering of all military secrets. Yet so successful were these efforts that the British remained completely in the dark about the fact that the Germans possessed a working electric torpedo until parts of one were recovered on the bottom of Scapa Flow following the investigation into the sinking of the *Royal Oak*.²⁴

²³ Ibid., 67-68

²⁴ John Campbell, *Naval Weapons of World War Two* (London: Conway Maritime Press. 1985), 260

Chapter 2

Anatomy of the Torpedo

In its simplified form, each torpedo consists of five basic parts: the propulsion system, the guidance system, the warhead, the pistol, and the depth-keeping device.

The G7a, like all previous torpedoes up to that point, worked on the principle of compressed air. The earliest successful torpedoes of 1886 were powered by feeding compressed air into a piston which in turn turned the propeller. Higher speeds could be attained by increasing the pressure of the air. Later, in 1904, it was discovered that performance could be further enhanced by injecting a liquid fuel such as kerosene into the air flow and igniting it, which would heat the air and cause it to expand even further, while the burned propellant also served to increase the power. Torpedoes of this type were known as “heated” torpedoes. This design could additionally be enhanced by using water to cool the combustion chamber, which allowed more fuel to be burned and increased the power output by feeding the resulting steam into the engine along with the rest of the combustion elements. Torpedoes of this type were popularly known, at least in the United States, as “wet heaters,” while those that did not generate steam were called “dry heaters.” The G7a differed from most wet heaters however in using Dekalin (decahydronaphthalene) instead of something more conventional such as kerosene as its fuel. The combustion of this material powered a four cylinder engine which drove two six-bladed propellers that turned in opposite directions in order to keep the torpedo on a straight course. The spent gas was expelled at the tail end of the torpedo, which accounted for the bubble wake that it left behind. The G7a had three speed settings: forty-four knots with a 5,000 meter

range, forty knots at 7,500m, and thirty knots at 12,500m. The top speed, known as a *Schnellschuss*, frequently overloaded the torpedo's engine, which meant that the setting was banned for most of the first half of the war.²⁵ The combustion chambers, or boilers, as well as the hulls, were found to be extremely prone to water erosion, so much that their further use was called into question. To prevent this corrosion, the Torpedo Inspectorate (TI) ordered each torpedo to be thoroughly immersed with the toughest possible lubricating grease.²⁶

The G7e was powered by a lead-acid wet cell battery. This battery was eight feet long and weighed .7 tons (711 kg). It consisted of fifty-two cells in a side by side arrangement that was housed in a battery container which could be slid in and out of the torpedo on two rails. These cells produced a total of ninety-two amp. Like the G7a, the G7e was also heated, albeit in a different way. The battery contained several heating elements that would preheat the battery before firing to a temperature of eighty-six degrees F (sixty degrees C). Heating the battery was crucial, because it increased the range of the G7e by roughly 60 percent.²⁷ This process was not without its dangers, as it lent to the formation of explosive gasses within the torpedo. This could be somewhat mitigated through continuous ventilation of the battery chamber with compressed air. This was impossible once the torpedo was slid into the tubes, however, with the result that it was important to keep the amount of time that the torpedoes were sitting in the tubes before firing to a minimum. On the other hand, too much continuous ventilation at thirty degrees C would lead to too much water loss from the cells, which after 120 days could no longer be counted on as combat ready.²⁸ Once heated, the battery would power a 100 hp electric motor that could power the G7e to a speed of thirty knots for a distance of 5000 meters. Past this

²⁵ *Torpedoes*. www.uboatpages.com. Campbell, 1-2.

²⁶ "Torpedoinspektion Abschrift Betrifft: Torpedokessel G7a," B.Nr. G 127/40, 27.1.1940, PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

²⁷ Robert C Stern, *Type VII U-boats* (Annapolis, MD: Naval Institute Press, 1991), 79. Miller, 92

²⁸ Rössler, *Die Torpedos der deutschen U-Boote*, 69

distance, the speed steadily decreased until at a distance of 6,000 meters the torpedo would begin to sink.

Once the torpedo had left its tube, it was the responsibility of the guidance system to ensure that it reached its target, which was accomplished by means of a gyroscope. Like the toy, the gyroscope on a torpedo is a spinning mass, such as a disc or a wheel, attached to a base (known as the gimbal) that allows the axis of the spinning mass to move freely in any direction and maintain its orientation regardless of the movement of the base. In a torpedo, the axis of the gyroscope would point down along the torpedo's length. The guidance system took advantage of the gyroscope's resistance to any change in motion by allowing a course to be programmed into the torpedo. This was accomplished by turning a small ring that surrounded the gyroscope to a designated position that corresponded to the heading that the torpedo was to take once it left the submarine. In their episode: "Hitler's Lost Sub," PBS explained how the gyroscope was used to steer the torpedo's course:

Firing the torpedo opened a valve that caused pressurized air from the air chamber to spin the gyroscope. As the torpedo leaves the submarine, the gyroscope is still lined up with the submarine and with the torpedo itself; the spinning mass will keep it pointing in the same direction, even when the torpedo changes heading. After traveling a set distance, the gyro mechanism kicks in. It senses that the ring and the axis of the gyroscope are not aligned. Via a connection to the torpedo's two directional rudders, it begins to turn the torpedo in the correct direction. Once the ring and the gyro axis line up, the rudders straighten out. From this point on, the gyro mechanism makes minor steering adjustments via the rudders, keeping the torpedo on a straight course.²⁹

²⁹ PBS NOVA Online, "Hitler's Lost Sub: How an Automobile Torpedo Works," <http://www.pbs.org/wgbh/nova/lostsub/torpworks.html> (accessed March 28, 2010)

This process was used to enable both the G7a and G7e to be programmed to make one turn from the course on which they were fired in any other direction up to ninety degrees from the base in one degree increments.³⁰

Once the guidance control had led the torpedo to its target, it was the responsibility of the pistol to ensure detonation. When war broke out, both the G7a and the G7e were equipped with the Pi1 pistol, which could be set for either an impact detonation (*Aufschlagzündung*; AZ) or magnetic detonation (*Magnetzündung*; MZ). Unfortunately for the Germans, as will soon be seen, the Pi1 in both its AZ, but particularly its MZ option, often failed to live up to its billing. The precise nature of these malfunctions will be dealt with later as they appear within our story. Eventually, the Pi1 was replaced, first by the Pi2 in late 1942/early 1943, then by the Pi3/MZ3, and later by the Pi4/TZ5. These all featured a much more reliable MZ, but by the time they were introduced the U-boats were so much on the defensive that their impact was minimal. After all, the best torpedo in the world does one little good if the boat cannot get into position to use it.

The technology of the AZ was nothing new. Developed by Dr. Schubert, it was basically a somewhat modified version of the old push pistol that had been used on the G/7 series during the First World War. It was a very simple design, comprised of a firing pin and four “whiskers.” In the case of a direct hit, the firing pin would close the firing circuit, which would activate the electrical detonator. The whiskers were angled so that they might achieve the same function in the event of a glancing blow against the target. According to the military demands, the AZ was supposed to guarantee a detonation down to a twenty-one degree angle of impact. As will later be seen, for such a simple design, the AZ would cause a host of problems that would be anything but simple to figure out.³¹

³⁰ Stern, 79

³¹ Stern, 79 Miller, 90

In contrast with the old fashioned AZ, the MZ setting on the torpedo pistol was very new. Indeed, it represented a technological breakthrough of tremendous proportions that was intended to revolutionize torpedo warfare. The idea was gleaned from the success of the magnetic mine during the First World War. The idea was simple enough. The earth itself was a big magnetic field of a more or less predictable nature that was capable of being altered or disrupted by large metal objects. Consequently, it was thought that a sensor in a mine calibrated to the local magnetic field would sense the passage of a metal overhead object, such as the hull of a passing ship, which could be used to trigger the mine's detonation.³²

The logical application of this technology was the torpedo, which at the time relied on a direct impact with the target to achieve a detonation. While direct impact generally worked fine on an unprotected and lightly armored merchantman, larger capital ships which incorporated armored "torpedo belts" along their hulls proved to be particularly resilient targets. Magnetic detonation seemed the perfect countermeasure to these magnetic belts because the detonation occurred under the hull as opposed to on its side, which obviated the effect of the armored belt.

As is explained by Eberhard Rössler, this idea had actually been in existence for quite some time, having been proposed in 1915 to the Torpedo Director in Kiel by Dr. Adolf Bestelmeyer, a private lecturer at the University of Göttingen. It was first his idea to bring about a detonation by using the induction voltage that would result when a metal ship would cut the vertical magnetic field line of a coil, which he had arranged inside the torpedo. However, it was found that the resulting current was too weak to close the ignition relay. In order to increase the intensity of this current, Bestelmeyer relocated the coil to the tip of the torpedo on a small, quick-rotating propeller, which generated a sufficient current to bring about a detonation in

³² Anthony Newpower, *Iron Men and Tin Fish: The Race to Build a Better Torpedo during World War II* (Westport, CT: Praeger Security International, 2006), 24

response to a change in the magnetic field, which would be considerably strengthened by the hull of the overhead passing ship. In 1917 he was actually able to achieve such a detonation, and his idea was approved for production. Unfortunately for him it was at this point too late in the war for his plans to be realized at the front, and they were shelved when the war ended. Bestelmeyer then left the Navy to take up his former job as professor, now at the University of Greifswald. Bestelmeyer's idea was taken up again, though, by Dr. Paul Schreiber at the TVA. Schreiber kept the basic principles of Bestelmeyer's idea, although he fine-tuned the pistol to take into account the changing intensity of the magnetic field in different parts of the earth by incorporating a zone chart that could be used to adjust the pistol.³³

Assuming the pistol detonated correctly, the effect was devastating. Unlike the detonation of the AZ, which exploded against the ship's side and therefore directed most of the blast's energy upwards, which had the effect of forming a very impressive but not necessarily fatal water geyser, the detonation of the MZ underneath the ship ensured that all of the blast's energy was focused squarely on the ship's weakest part. This blast, which was intended to occur right beneath to target's keel, "created a gigantic air bubble capable of lifting the ship out of the water. At the apex of the bubble's upward travel, the bow and stern flexed toward the sea, creating an arch in the otherwise rigid keel. The bubble then quickly collapsed, leaving a void into which the unfortunate victims now fell. This action created the opposite effect on the keel, with the bow and stern now flexing upward. As strong as a ship's keel might be, naval architects never intended for it to survive such a cycle of stresses and strains."³⁴

The devastating blast was accomplished by a number of different chemicals contained in the torpedo's warhead. The chief ingredient was *Hexanite*, which was a mixture of

³³ Rössler, *Die torpedos der deutschen U-Boote*, 78

³⁴ Newpower, 36-37

hexanitrophenylamine (HND) and *trinitrotoluene*, known more commonly as TNT. The power of this mix was later increased even more when the Kriegsmarine began adding powdered aluminum to the hexanite.³⁵ The warhead thus came to be composed of a 67:8:25 TNT/HND/aluminum ratio. Total weight was 617 lbs.

The final essential aspect of the torpedo was the depth-keeping system, which would be determined by the captain before loading. The torpedo could be set to run at any depth up to fifteen meters. Whatever depth was decided upon would be influenced by a number of factors. For AZ detonation, the torpedo had to run shallow to avoid passing underneath the vessel but deep enough to avoid breaking the surface, which was referred to as a surface runner. Torpedoes which broke the surface could be easily spotted by the enemy ship, alerting it to the U-boat's presence and oftentimes spelling the U-boat's doom. The MZ detonation was trickier; it had to be fired deep enough to pass under the vessel's keel, but if it ran too far under the ship then the change in magnetic field might not be strong enough to be registered by the coil. The torpedo had to either be fired at periscope depth, or more frequently from the surface at night, although later versions such as the *Zaunkönig* could actually be launched from a depth of fifty meters.

The depth-keeping mechanism for the period under consideration was the *Tiefenapparat* 1, abbreviated as the TA1, which functioned with the use of a pendulum and hydrostatic valve. The torpedo pendulum was connected to the two rudders that controlled depth. Once it was fired and was away and running, if the torpedo began to point downwards below the assigned depth then the pendulum would rock forward, causing the depth rudders to guide the torpedo upwards. The same principle applied if the torpedo began to run upwards; the pendulum would this time rock backwards, causing the rudders to steer the torpedo down. The depth was controlled by a

³⁵ Miller, 89

diaphragm and a compressed spring, which would sense the level of water pressure outside the torpedo and adjust the rudders accordingly.³⁶

Torpedoes were extremely complex devices which, if ignored for extended periods of time, would often break down or otherwise malfunction. Because of this, there was a constant need to test them and to perform continuous maintenance every few days both on shore and while at sea, to ensure that the complicated steering, guidance, propulsion, and depth-keeping systems were in proper working order. As all torpedoes were very long, heavy and cumbersome, and coated in thick layers of heavy grease, this was extremely difficult to perform in the cramped environs of a U-boat. All bunks and tables had to be put up simply to make room to take the torpedoes out of the tubes and to bring down the reloads that were stored in compartments on the deck.

Because of its great importance to the functionality of the weapon, torpedo maintenance was carried out according to a very strict set of detailed instructions issued by the Torpedo Inspectorate (TI). A TI memo from October 1, 1940, concerning the regulation of the G7a torpedo following shooting practice testing gives a fair indication of the time involved in conducting this maintenance. Immediately after the conclusion of firing exercises the participating ships were required to immediately prepare the torpedoes for long term storage. Certain parts of this procedure, such as a thorough engine examination, could only be performed at a torpedo maintenance facility ("*Torpedoersatzort*") although much could be performed on the U-boats provided they had the required equipment. Different systems required different amounts of time to regulate. For example, regulating the steering mechanism, the *Geradelaufapparat (GA)*, for the twelve torpedoes carried on board a surface vessel such as a cruiser took about 3

³⁶ PBS NOVA Online, "Hitler's Lost Sub: How an Automobile Torpedo Works," <http://www.pbs.org/wgbh/nova/lostsub/torpworks.html> (accessed March 28, 2010)

days, while an examination of the engines took five days. It was absolutely critical, however, that the work be undertaken as soon as possible, as the regulations governing the postponement of such work allowed for a period of only five days. It was understood that any postponements past this allowed period increased the likelihood for the torpedo to malfunction. Due to the time taken to conduct this maintenance, these ships would not be combat ready for an average period of four days, except in emergency periods when they could be made ready after twelve hours.³⁷

Attacks were made either submerged or on the surface. Surface attacks, conducted at night, were far more common than those made while submerged. Dönitz believed that provided the attack was made at night, the small size of the U-boat, painted a grayish-black, left a tiny silhouette and therefore made it very difficult to spot. Although a surfaced U-boat could be detected by radar, this became inconsequential once the boat got close enough to the convoy, as radar was unable to differentiate between the U-boat and the ships of the convoy. This style of fighting meant that the maximum range of the torpedoes seldom corresponded to the actual firing range, as the best captains liked to fight it out in the midst of the convoy where the confusion would be greatest for the escorts. As Allied ASW methods improved, however, the average firing range steadily increased, from just less than 1,000 yards in 1939 and 1940 to 2-3,000 yards from 1943 onwards.

Attacks from the surface were always conducted from the bridge, normally by the executive officer (known as the First Watch Officer or 1WO) rather than the captain. The 1WO would use a special sighting instrument mounted on the bridge known as the *Uboot-Zieloptik* or *UZO* (U-boat targeting optical sight). Attacks while submerged, which normally occurred during the day, were made by the captain from the control center located in the conning tower by means

³⁷ "Torpedoinspektion Abschrift Betrifft: Arbeiten an den Torpedos G7a nach Schießübungen im Kriege," B.Nr. G 8024 T, 1.10.1940, PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

of the attack periscope, which was different from the normal observation periscope. Both the UZO and the attack periscope would be used to calculate the target's speed, estimated range, target angle on the bow, torpedo speed, and a correction factor for the target's rate swing. These calculations would be called out to the executive officer, who would plug them into the targeting computer, known as the *Vorhaltsrechner*. This would calculate the torpedo's proper direction angle, point of convergence, shot angle, and maximum range, the data being sent down to the torpedo room where the chief torpedoman would plug them into the gyro.³⁸

Torpedo production took place in five locations: Deutsch Werke in Kiel, Julius Pintsch in Berlin, Auto-Union in Zwickau, Borgward in Bremen, and Planeta in Dresden. Production figures increased dramatically as the war progressed. Before the war a mere seventy per month were produced, which increased to 1,000 a month by the spring of 1941, and a peak of 1,700 per month in 1943. From here they declined slightly to 1,400 per month in 1944. About a total of 70,000 were produced during the course of the war, although it is estimated that only 10,000 were fired in anger. Of these the vast majority, 7000, were the trackless G7e, with 2300 G7a's, and 640 acoustic homing torpedoes.³⁹

³⁸ Miller, 94-96

³⁹ Campbell, 260

Chapter 3

The *Torpedokrise* Phase I (September 1939 – April 1940)

On September 1, 1939, Hitler invaded Poland. Two days later, September 3, following the expiration of the Franco-British ultimatum demanding that Germany withdraw her forces from Poland, Great Britain declared war on Germany, followed soon after by France. The Second World War had begun.

Unlike some high ranking Nazi officials, who, still intoxicated from Hitler's remarkable string of bloodless victories over the Allied powers, may have entertained hopes that this war would also be a quick and bloodless affair, Karl Dönitz, who at the time held the rank of Commodore with the title *Führer der Unterseeboote* (Commander of Submarines, or FdU), was under no illusion of the severity of the moment. "This war," he told his assembled officers on September 4, "must be taken very seriously. Make no mistake about it – it may well last for seven years, and we shall probably be only too happy to see it end then in a peace by negotiation."⁴⁰

This grave assessment of the present conflict was no doubt occasioned not only by his appreciation of the strength of his enemies, learned through his own experience of fighting the British during the previous war, but also by the inadequacy of his own force in comparison to that of his enemies. This inadequacy in the main referred to the pressing lack of U-boats. Dönitz had repeatedly made it known to both his superiors in the Navy and to the Nazi government that he considered it essential that Germany enter any war with England with a force of no less than

⁴⁰ Karl Dönitz, *Memoirs Ten Years and Twenty Days*, translated R.H. Stevens (Annapolis, MD: Naval Institute Press, 1990), 51

300 operational U-boats. This was the number he believed was required to successfully strangle the vast English merchant marine and achieve victory, but it was a vision that was not shared by the rest of the Navy. Prewar naval construction under the new regime followed the parameters of the so-called “Z Plan” drawn up in 1938 and approved by Hitler in January 1939. Certainly based on Hitler’s oft repeated statements that on no account would he permit any immediate war to develop with Great Britain, the Z-Plan envisioned the construction of a massive force of six battleships (in addition to the *Bismarck* and *Tirpitz*), eight cruisers, four aircraft carriers, a number of light cruisers, and 233 U-boats to be completed by 1948.⁴¹ Aside from reflecting the obvious delusions of the new regime, which failed to recognize that such a plan could never be carried out while simultaneously satisfying the demands of the new army and air force, the Z-plan also showed how little naval strategic thinking had changed from one generation to the next. Apparently, the new navy was to be committed to the idea of a large surface fleet just as the old one had been in the Tirpitz era. Nevertheless, this fantastical policy remained the focus of the navy during what proved to be the last precious months it had to prepare for a war it had been told would not come. As a result, instead of the 300 boats that Dönitz had said were necessary, he entered the war with a total of forty-six boats ready for action, only twenty-two of which were suitable for war in the Atlantic. As Dönitz would later write in his memoirs, “Seldom indeed has any branch of the armed forces of a country gone to war so poorly equipped.”⁴²

⁴¹ Ibid., 38

⁴² Ibid., 47

The onset of torpedo failures and initial reactions to them (September – December 1939)

The same day that Britain and France declared war on Germany, one of these twenty two Atlantic-worthy boats, U-30, under the command of Fritz-Julius Lemp, a future U-boat “ace,” was cruising northwest of Ireland in the northernmost extent of his patrol area. Although he was well off the normal sea-lanes, at around 1630 local time the bridge watch spotted a large vessel on the horizon, coming from the direction of England. Quickly submerging so he could get a better view of the vessel undetected, Lemp could see through the observation periscope that she was running in a zigzag pattern, a typical form of behavior by ships wary of submarines. She was also sailing without her running lights and was armed with what appeared to be a small deck gun.⁴³ Based on this observation, Lemp judged her to be an auxiliary cruiser and hence a legitimate target according to the *Preisenordnung*.

The *Preisenordnung*, or “Prize Ordinance” in English, was an extensive set of rules contained within the London Submarine Agreement of 1936, to which Germany was signatory, intended to govern the conduct of commerce raiding. These prescribed that when approaching a merchantman, regardless of whether she was armed or not, the U-boat first had to surface within plain view and order her to halt, following which it had to send aboard a boarding party to check for contraband. If the merchantman was found to be carrying such contraband, the U-boat could sink her only after ensuring the safety of the crew by placing them in the lifeboats and providing them with directions to land along with food and water. Exempted from these rules were ships proceeding under escort, ships that refused to submit to inspection, or transports belonging to the armed forces of the belligerent nation. Only if the target met these conditions could the U-boat

⁴³ Blair, 66

attack without warning.⁴⁴ Needless to say, aside from being extremely dangerous to the U-boat, as they required the U-boat to remain on the surface for extended periods of time, during which she was at her most vulnerable state, they negated the single biggest advantage of the U-boat, which was her stealth. Nevertheless, as Hitler was at the time hopeful that he could still make peace with England and France and so keep them out of the war, he demanded that all U-boats follow the *Preisenordnung* to the letter.

Feeling that this strange ship did in fact constitute a legitimate target, Lemp decided to attack her with two torpedoes, which he fired at 1940 hours. The first ran true and struck the unfortunate vessel, while the other veered off course at a wild angle, causing Lemp to dive deep lest it should circle back and hit his own vessel. Once the danger was passed Lemp took the boat to the surface and, finding that the vessel was still afloat, fired another torpedo at her which also malfunctioned. By this point the boat's silhouette was clearly visible. Lemp went below to identify his vessel, referencing it to his copy of *Lloyd's Register*, which was carried by every captain. Only then did he discover that he had made a terrible error. His target was not an auxiliary cruiser at all, but rather the passenger liner *Athenia*, on route to Canada with 1,103 men women and children, including 311 Americans. Lemp left the sinking vessel to its fate. Even though the loss of life was relatively slight – 118 dead including twenty-eight Americans – from the German perspective it was a complete disaster.⁴⁵ While the Führer was at work trying to broker a peace with the Allies, and by extension convince the rest of the world that the German military would abide strictly by the rules, Lemp had sunk a passenger liner in complete violation of the prize rules. The comparison to the sinking of the *Lusitania* was obvious, and the British of

⁴⁴ Dönitz, 54

⁴⁵ Blair, 67

course made full use of it. Obviously in this maelstrom of negative publicity nobody gave Lemp's torpedo failures a second thought.⁴⁶

Nor did anyone give it a second thought when just a few days later, another U-boat commander, Günther Prien, reported an incident similar to U-30's. On September 7 he had spotted a British freighter, the *Gartavon*, sailing independently and, in accordance with the prize law regulation, had attempted to stop the vessel to board her. It soon became apparent however that the crew of the freighter had other ideas. The *Gartavon* put on top speed in an effort to outrun her attacker and undoubtedly would have radioed an SSS to home – the submarine distress code – had not the gunners managed to knock out her radio antennae with a well aimed shot from U-47's deck gun. With no radio, the *Gartavon* slowed to a stop, lowered a boat, and just as Prien was preparing his boarding party, suddenly put on steam and headed straight towards U-47 in an attempt to ram her. Only the quick reflexes of Prien and his crew managed to save U-47 from what would otherwise have certainly been an inglorious demise. No longer bound by the cumbersome prize rules, Prien fired a torpedo which promptly malfunctioned and ran erratically, missing the *Gartavon* entirely. The failure turned out not to matter much, however, as Prien was able to dispatch the *Gartavon* with a few additional well placed shots from his deck gun.⁴⁷

In hindsight it is interesting to reflect on the extent to which these initial encounters of the war were indicative of the course of events to come. In these two instances, occurring over the first five days of war, four torpedoes had been fired, yet only one had hit. But as the final result in both cases were successful – much to Dönitz' chagrin in the case of the former – the failures

⁴⁶ The German High Command for their part would do all they could to deny that the *Athenia* had been sunk by a U-boat, even changing the content of U-30's war log (*Kriegstagebuch* or KTB) to show that she had been nowhere near the *Athenia* at the time.

⁴⁷ Newpower, 40 Blair, 80

received little to no attention. Incidents such as these, however – success despite the appearance of torpedo failures – would prove the exception. Very soon events would arise that would force Dönitz, by now holding the rank of Rear Admiral with the title *Führer der Unterseeboote* / *Befehlshaber der Unterseeboote* (from here abbreviated FdU/BdU), along with the rest of the naval high command, to acknowledge the role of torpedo malfunctions (*Versager*) as one of the primary agents hindering the success of the U-boats.

One such event came a week after the incident with the *Gartavon*, over September 13 and 14, and involved three skippers – the same unfortunate Fritz Julius Lemp of the *Athenia* incident, Gerhard Glattes, a young thirty year old in command of U-39, and Otto Schuhart, also thirty, in command of U-29.

Schuhart's troubles actually began the day after Prien's incident with the *Gartavon*, on September 8, although as in the previous two examples, the end result was successful. At the time Schuhart, who is best remembered for sinking the British aircraft carrier *Courageous*, was part of a group of seven boats assigned to patrol the area immediately west of the English Channel where the sea lanes to and from Britain converged, which the British called the Western Approaches. During the course of the day Schuhart encountered the massive 10,000 ton tanker *Regent Tiger*.⁴⁸ It was an interesting situation for Schuhart, who until then had not been exactly sure of what he should do if he encountered an enemy. He had spent most of the previous day mulling over the intangibles of the *Preisenordnung*, such as fretting about how he could ensure the safety of the crew while making sure they did not radio for help, or whether he could still attack a vessel if the weather did not permit him to first send over a boarding party.⁴⁹ As it was, his fears were unnecessary. It was a beautiful sunny day with only a few clouds when he

⁴⁸ Blair, 88-89

⁴⁹ Otto Schuhart, U-29 KTB, 8.9.1939, PG 30026/1-19, National Archives Microfilm Publication T1022, Roll 2970

encountered the *Regent Tiger*. Moreover, with the exception of the radio operator who, as might be expected, sent out an SSS after Schuhart ordered the ship to stop, the crew was rather obliging, shutting off the engines and abandoning ship after one shot from U-29's deck gun. After a moment's debate about what to do with the poor radioman, who foolishly remained aboard *Regent Tiger* when his comrades had jumped off, Schuhart decided the situation could not be helped, and, in the absence of the proper zone settings which he had not yet received from OKM, fired a single G7a of the AZ type. Despite the limited swell, the torpedo ran poorly, veering so far off course that Schuhart feared it would turn back in a circle, before finally righting itself to hit the *Regent Tiger* under the bridge, which sank soon after.⁵⁰

Schuhart's torpedo difficulties continued with his next two victims. A few days later on the 13th, around 1:10pm, he encountered what in his log he referred to as a "high seas tug" (*Hochseeschlepper*), which turned out to be the 900 ton *Neptunia*. Events proceeded along similar lines to the *Regent Tiger*. Schuhart surfaced 2,500 meters from the *Neptunia* and fired a warning shot across her bow. Instead of stopping, however, the *Neptunia* attempted to put on steam and escape, but ten further shots from the deck gun persuaded her to stop. As the radioman sent out a distress call, Schuhart could see smoke on the horizon from other ships and decided to destroy the *Neptunia* quickly. Still lacking the proper zone charts, he decided to experiment with the MZ, firing a single G7e MZ type with four meter depth setting. As with the previous episode, the torpedo began poorly but managed to right itself, but instead of scoring a hit it exploded roughly 150 meters before the target. A second G7e MZ fired by Schuhart finished the job. Schuhart radioed this incident back to BdU, suggesting in his war log that

⁵⁰ Ibid.

“after the end of the security run the combat pistol must have exploded as a result of external electromagnetic forces acting on the torpedo.”⁵¹

The following day, the 14th, was even more eventful, and began with Fritz Julius Lemp encountering the British freighter *Fanad Head*. Determined to avoid a repetition of his prior experience with the *Athenia*, Lemp made what must have been an extremely thorough reconnoitering of *Fanad Head* to determine her identity before deciding to stop her. Following the *Preisenordnung* to the letter, Lemp surfaced, ordered the *Fanad Head* to stop, and sent over a boarding party to examine the cargo. The *Fanad Head* complied with Lemp’s request, but only after radioing an SSS.⁵² This message was picked up by the aircraft carrier *Ark Royal*, which, unbeknownst to Lemp, was nearby and immediately launched three Skua aircraft armed with anti-submarine bombs to aid the *Fanad Head*. Although some of his crew was still setting demolition charges on board the *Fanad Head*, the sudden appearance of the aircraft forced Lemp to make an emergency crash-dive, but in his haste to get under he forgot to cut the dingy that was still lashed to U-30’s stern. The Skua pilots now used this dingy as a floating marker, dropping their bombs directly overhead. In what must certainly be considered one of the more bizarre incidents of the war, the contact with the water caused the bombs to “skip” back into the air and detonate, creating huge geysers of water and shrapnel directly in front of the Skuas’ path which tore into the aircraft, forcing two of them to ditch. Still alive and scarcely believing his luck, Lemp thought better of his decision to destroy the *Fanad Head* with demolition charges. Once all of his crew was back aboard, he fired a spread of four torpedoes from the bow tubes, all of which malfunctioned or missed. Finally, a fifth torpedo from the stern tube did the job.⁵³

⁵¹ Entry of September 9, 1939, *ibid*.

⁵² Newpower 40-41

⁵³ Newpower, 41 Blair, 87

Meanwhile, at the same time that *Ark Royal* was launching her initial strike against U-30, another hunter happened upon the scene. Gerhard Glattes, in command of the type IX boat U-39, was heading home to port after a fruitless voyage during which he had not spotted even a single target. Now, just as he and the crew had all but abandoned the hope of action, the huge shape of *Ark Royal* suddenly loomed before his periscope. Having turned into the wind to launch her flight of Skuas against U-30, the giant carrier had temporarily left her escorts and was all alone, left to the unforgiving mercies of the U-boat. Maneuvering to within 800 meters of his unsuspecting prey, Glattes let off a salvo of three G7e torpedoes with magnetic pistols.⁵⁴ The tension on the boat was palpable as the IWO counted off the seconds on his stopwatch. Suddenly, loud detonations were heard, although strangely they occurred earlier than was expected. Actually, none of the torpedoes had hit *Ark Royal*. Instead, they had exploded underwater prematurely, close to the ship, but not actually under it. The effect, however, was immediate. The escorts that had temporarily fallen behind *Ark Royal* during her turn into the wind had obviously seen the large plumes of water and smoke, and instantly knew they came from a submarine. It did not take them long to locate U-39 and subject her to a punishing depth-charge attack, which flooded the boat and, as the water came into contact with the cracked batteries, emitted a deadly chlorine gas.⁵⁵ With all power gone and no hope of escape, Glattes blew all his tanks and U-39 shot to the surface, into the waiting hands of the destroyers. Fortunately there were no casualties. All of the crew managed to crawl through the hatches and jump over the side, where they were picked up in the water by the British. For Glattes and the

⁵⁴ Sources vary on the type of torpedoes used. Cajus Bekker claims they were two G7a torpedoes with magnetic pistols, the trails of which guided the *Ark Royal's* escorts to Glattes' position. See Cajus Bekker, *Hitler's Naval War*, ed. Frank Ziegler (London: Macdonald & Jane's, 1974), 121

⁵⁵ Newpower, 41

crew, who all went into captivity, the war was over. The boat, aided by the scuttling charges set by the crew, went down by the bow into the sea.⁵⁶

Lemp, whose attack on the *Fanad Head* began the whole episode, had more luck. He soon returned to the surface to pick up the rest of his crew stranded on board the *Fanad Head* during the first Skua attack, and was also able to rescue both of the downed English Skua pilots, despite being strafed by the third Skua as he did so. Soon, however, he had to crash dive again to avoid another wave of planes, which attacked with eleven bombs. To make matters worse an additional three destroyers soon arrived on the scene and subjected Lemp to an awful depth charging, during which his boat sunk to the unprecedented depth of 472 feet, before finally managing to escape six hours later. Lemp's luck had held.⁵⁷

Upon learning of these incidents Dönitz immediately went about getting to the bottom of things with his characteristic swiftness. The Admiral Superintendent of Dockyard, whom Dönitz had spoken to that very same day, the 14th, yielded a few answers that at least partly explained the early erratic behavior exhibited by some of the torpedoes during their runs. The torpedoes, he said, had been fitted with gyro-angling gear for curved torpedo tracks, but the torpedo tails had failed to receive the required modification to support these shots.⁵⁸

Dönitz also forwarded Schuhart's report to the Torpedo Directorate (TI) along with another he had received the very next day, also from Schuhart, who had experienced a second pair of premature detonations during a subsequent attack on the tanker *British Influence*. The TI was greatly puzzled by this report, which was the first information they had received which indicated a potential problem with their torpedoes. The TI initially attributed these failures to a faulty zone setting that might result from an incorrect calculation of the boat's geographical

⁵⁶ Blair, 87-88

⁵⁷ Ibid., 86

⁵⁸ Newpower, 43

position. Pending the results of further testing, the TI suggested that premature detonations might in the future be avoided by desensitizing the MZ by setting it back two zones from what was stipulated on the *Zonenkarte*. However, since the strength of a ship's magnetic field varies depending on its size, these orders effectively limited the use of the MZ to targets displacing 3,000 tons or more, since anything less might not emit a magnetic field of sufficient strength to detonate the warhead. Since it was not yet possible to switch the pistols between the AZ and MZ settings, to overcome this problem the TI recommended that against such targets of less than 3,000 tons only torpedoes with the AZ type pistol be used.⁵⁹

In hindsight, considering the information available to them at the time, or rather the lack thereof, the TI's initial suspicion of improper zone settings as being the likely culprit for the premature detonations appears quite reasonable. Given the fact that during the time of his prematures Schuhart did not even have the prescribed zone settings for the area he was in, and that his attack on the *Neptunia* was according to his own war log an "experimental shot" with the MZ, it would not be out of the question to suppose that Schuhart had incorrectly calibrated the MZ pistol which in turns caused a premature detonation. Although this might well have been the actual explanation, fixing the problem of premature detonations in the *U-Bootwaffe* as a whole would be a far more time consuming process marked by continuous alterations and changes in firing procedure than a few simple adjustments to the *Zonenkarte*.

Three days later on September 17 the TI's recommendations were further modified following the receipt by BdU of a report from Johannes Franz, whose boat, U-27, had sustained some damage during an attack on a British freighter after two of his torpedoes had exploded prematurely after an exceptionally short run of only 273 yards.⁶⁰ BdU therefore decided that

⁵⁹ Rössler, *Die Torpedos der deutschen U-Boote*, 83

⁶⁰ Blair, 91

until the MZ had been improved the boats were to use only AZ detonation. In any case, the order had little to no impact, at least at first. At the time U-boats carried torpedoes equipped with either the MZ or AZ pistol. The option that would later allow the commander to interchange these settings while on patrol had not yet come into being, so whatever setting the pistol was set to when delivered to the boat was what it was stuck with for the duration of the patrol. It was impossible, in other words, for a commander to change his torpedo's pistols from MZ to AZ setting and vice-versa. Consequently, as the head of the TVA, Rear Admiral Oskar Wehr, pointed out, unless the U-boat in question were carrying only torpedoes fitted with AZ pistols, Dönitz' order made no sense.⁶¹ As the commander in chief of U-boats, Dönitz would of course have known this, and hence the order is probably more indicative of his growing frustration with the current state of affairs than it is of a conscious attempt to improve things.

Dönitz' frustration finally found its way into his War Log the following day. On September 18 he wrote: "The inadequate firing of torpedoes is causing grave concern. G7a and G7e torpedoes have repeatedly exploded after a run of about 250 meters, before reaching the target. In one case the boat was slightly damaged owing to this (U-27). The Torpedo Inspectorate does not know the reason at present. Everything is being done to remedy the defect."⁶² Although Franz was hardly the first captain to experience problems with his torpedoes, which as we have seen constituted a continuous problem quite literally since the very first day of the war, it took over two weeks for them to find their way into Dönitz' war log. This delay is explained both by the initial lack of information available and by the plethora of other unforeseen problems and concerns that the war naturally revealed.

⁶¹ "Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures," *Auf Anraten TI geht B.d.U. vom Mz-Schuß auf AZ-schuß über*, 27.5.1941, PG 31057, Band II, seite 173, National Archives Microfilm Publication T1022, Roll 3467

⁶² Karl Dönitz, *Kriegstagebücher Des Führers/Befehlshaber der Unterseeboote* (FdU/BdU KTB), 18.9.1939, PG 30248, National Archives Microfilm Publication T1022 Series, Roll 3979, 25

The initial lack of information available to BdU was primarily the result of German efforts to ensure the secrecy of the boats' locations by largely maintaining radio silence, except when it was necessary to coordinate action and report other important information. Although the TI would later stress to BdU and to the fleet the importance of reporting torpedo failures, at this stage in the war no directives to this end existed, which meant that it was up to the individual captains to decide whether a seemingly isolated torpedo failure warranted breaking radio silence. As such, Dönitz and the TI initially had only a trickle of scattered reports on which to base their conclusions.

Additionally the initial experience of war revealed to Dönitz a host of other problems on which he had not reckoned during peacetime and which now occupied his full attention. There were not enough operational torpedoes on hand, and insufficient numbers in reserve to replace those which were fired during combat.⁶³ Indeed the most pressing issue at this time was not the torpedoes, but rather the inadequate number of boats available for patrol. Although the ill-judged Z-plan had by now been shelved, construction priority still nevertheless went to completing several of the proposed surface ships, so that during the first six months of war only a paltry number of six oceangoing U-boats had been built.⁶⁴ Of the twenty-two oceangoing boats with which Dönitz had started the war, those which had not been sunk were frequently tied up in the dockyards for what seemed like interminable periods of time on account of hitherto undiscovered design flaws which had only been revealed under the strains of war. The engines were not strong enough and needed replacing. The engine exhaust valves, which closed against the water pressure rather than with it, leaked to such an extent at certain depths that the noise

⁶³ Dönitz, FdU/BdU KTB, 17.8.1939, PG30247, National Archives Microfilm Publication T1022 series, Roll 3979, 2

⁶⁴ Blair, 102

made by pumping out the water actually gave away the boat's location.⁶⁵ These too needed to be corrected. Not counting the time required to remedy these problems, boats newly returned from patrol demanded at least three to four weeks at the dockyards for refitting. Needless to say, the organization of the dockyards, compounded as it was by the general lack of skilled labor, was insufficient to cope with the large numbers of boats tied up and also had to be fixed.⁶⁶

Six days after the sinking of U-39, the loss of a second boat brought the problem of torpedo failures squarely to the forefront at U-boat command. Once again the unlucky fellow at the center of attention proved to be the poor Oberleutnant zur See Johannes Franz. Homeward bound on the night of the 19th, U-27's bridge watch sighted just a few minutes before midnight a line of six dark shapes against the horizon. Franz, perhaps aware that his boat currently held the inglorious distinction of being the only one of the seven Type VII boats of the Salzwedel Flottilla not to have torpedoed and sunk a ship (although he had destroyed two trawlers by deck gun and demolition charges),⁶⁷ took these shapes to be six British cruisers and boldly readied the boat for an attack. With hopes of bagging two or maybe even three cruisers with one strike, Franz surfaced U-27 for a night attack and fired a spread of three torpedoes equipped with MZ pistols at a depth of twelve to thirteen feet, of which two predictably prematurely detonated while the third missed altogether. Alerted by the explosions, the targets, which actually turned out to be a line of seven English destroyers, rushed in to attack. Franz attempted to elude his pursuers by diving to the extraordinary depth of 393 feet, but he was ultimately unable to shake the British sonar. Following a particularly damaging barrage of depth charges which caused severe flooding, Franz decided to blow his tanks and make a break for it on the surface. U-27 emerged

⁶⁵ Gunter Hessler, *The U-Boat War in the Atlantic 1939-1945* (London: Her Majesty's Stationary Office, 1989), 15

⁶⁶ Dönitz, FdU/BdU KTB, 14.12.1939, PG 30253, National Archives Microfilm Publication T1022 series, Roll 3979, 69

⁶⁷ Blair, 91

from the dark sea amidst a maelstrom of searchlights and blazing guns. Recognizing the impossibility of escape, Franz decided to “abandon ship” by expeditiously throwing himself over the side. The crew, whom Franz in his bizarre display of naval gallantry had forgotten to instruct to abandon ship, soon followed their captain’s lead and leapt from the deck of the doomed U-boat, where they were rescued by the surrounding destroyers. Were it not for the presence of mind of the Chief Engineer, who on his own initiative had rigged U-27 with scuttling charges, the boat surely would have been captured by the British.⁶⁸ As it was, U-27, which only two days before had ironically been damaged by the premature explosions of her own torpedoes, slipped once more beneath the waves, doomed once again by her torpedoes. Her story had come full circle.

Back in Germany, the TI had in the meantime been working on a way to alter the torpedo pistol so that it might be set for either AZ or MZ detonation. By the end of September, it had come up with such a device, which was known as *Schalterstellung A* (Switch Setting A). The introduction of the device to the fleet on October 2 came just in time, as it now made it possible to carry out Dönitz’ previous orders that all boats were to fire using only the AZ setting. A new directive to this effect was issued to the fleet.⁶⁹ The downside to this order, however, was that although it theoretically gave the German U-boats a way to switch to a more reliable detonation, the resultant AZ induced explosion lacked the sheer destructive power of the MZ type. Hence the *Schalterstellung A* was never considered by anyone to be a permanent fix to the torpedo problem, but rather a temporary emergency measure to buy the TI some time in which to perfect the MZ type, which had always been envisioned by the *Marineleitung* as being the primary detonator system for the U-boat. In any event, from October 2 onwards boats equipped with

⁶⁸ Newpower, 42

⁶⁹ Rössler, *Die Torpedos der deutschen U-Boote*, 83

pistols using the *Schalterstellung A* option were to use only the AZ option until further notice. The following Sunday, October 8, 1939, during a special meeting on torpedo failures attended by the heads of the TI, the TVA, the *Torpedoerprobungskommando* (TEK), as well as their military advisors, these orders were extended to include surface ships as well as the U-boats. From now on, every type of vessel in the German navy was to use impact detonation only.⁷⁰

The decision to shelve MZ detonation should now have directed attention to the suddenly all important question of depth-keeping, but as events were to show, this was not the case. That it did not was primarily the result of the Navy's prewar infatuation with the new magnetic pistol, to whose success an exact depth-keeping was not regarded as essential, because the torpedo theoretically only had to make contact with the target's magnetic field to detonate as opposed to the target itself. Although it is true that the strength of a ship's magnetic field will dissipate the farther away from it the sensor is moved, it was thought that a difference of one or two meters would not make that much of a difference. Needless to say, the situation became completely different if the torpedo was actually required to make contact with the target in order to detonate. Here the same one or two meters that played little part in a successful MZ detonation could in the case of impact detonation spell the difference between the torpedo successfully hitting the target or else passing harmlessly underneath it.

As it turned out, such a problem did exist. What was most shocking, however, was not that the torpedoes were prone to run a few meters deeper than set, but rather that this was already a known fact within the TVA, whose representatives still nevertheless refrained from saying anything about it during the meeting on the 8th. Actually, the issue had already been raised once before, at a meeting of TI officials earlier that September. *Korvettenkapitän* August Kattentidt,

⁷⁰ Ibid., 83

then serving as a *Referent* or advisor with the TI, had apparently been told just before the outbreak of war by a Dr. Bartrams that the new depth spring installed by the TVA, which was supposed to fix all problems with depth setting, did not work and that consequently the torpedoes might not be capable of operating against destroyers and other shallow draft vessels. This revelation had led to Kattentidt raising the issue at the aforementioned September meeting, but apparently to no avail.⁷¹ Perhaps because of his earlier failure to draw attention to the issue, Kattentidt, who was also present at the meeting of the 8th, did not bring up the issue.

But as mentioned before, Kattentidt was hardly alone, as nobody else present at the meeting said anything either. The reason for this silence is not exactly clear. When later asked by the court of inquiry appointed to investigate the torpedo failures why, in his opinion, nobody present at the October 8 meeting had bothered to bring up the critical problem of depth control, Kattentidt was unable to give any clear answers, aside from saying that perhaps the failure of Admiral Wehr, head of the TVA, to mention the issue might have discouraged others from doing so as well. In addition, he mentioned that the staff of the TVA had learned from experience during the introduction of the AZ pistol that thoughts on the depth issue were not likely to be requested, and mentioned that out of a “certain inhibition, none of us brought these known shortcomings to light.”⁷² Admiral Wehr, who as the head of the TVA, the agency to which these problems were already known, and who therefore more than anyone else then present attracted the harshest criticism from the court of inquiry for failing to mention the depth problems was likewise unable to give any solid reasons to account for his forgetfulness during this meeting. His answer to the same question posed by the court of inquiry to Kattentidt was that “the

⁷¹ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, “Sitzung am 8.10.39 Stillschweigen über Tiefenhaltung,” Anlage dd, Band IV, seite 116, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

⁷² Ibid., Band IV, seite 116

question of the depth-keeping was simply gone from my memory,” which he attributed to the never ending number of problems and work that as the head of the TVA he was required to deal with on a daily basis.⁷³ Moreover, following the conclusion of the meeting, Wehr was stopped on the way to his car by Captain Rudolph Junker, Chief of Staff to the head of the TI, Admiral Götting, who made a point of asking Wehr whether everything was in order with the depth-keeping.⁷⁴ As strange as it may seem, despite being specifically reminded, Wehr responded by asking Junker “what do you imagine is *not* satisfactory?”⁷⁵

Now that the MZ had been abandoned by the entire fleet, it would seem appropriate before forging ahead with the rest of the story to take a few moments to discuss what was exactly so calamitously wrong with the magnetic pistol that led to its use being revoked in the first place. Although it sprung from a relatively simple concept, the MZ itself was an incredibly complex device, with which a number of things could go wrong and cause it to fail. On the conceptual level, the very idea of a large electric current within the same vicinity as seawater and explosives should be cause for concern. If there were any leaks that allowed any of the outside water to come into contact with the torpedo’s internals, it could result in a short-circuit, which could easily trigger a premature detonation.⁷⁶ In regards to depth, the pistol “depended on a duplex coil rod...which was not difficult to degauss so that it only operated 60-90 cm (2-3 feet) below the hull.”⁷⁷ In other words what this meant was that even the slight depth variation which was reckoned to be acceptable by the torpedo authorities could easily result in a failure to detonate.

⁷³ Ibid., “Sitzung am 8.10.39 unter meiner Leitung bei TVA. . .“ Anlage q, Band II, seite 173 u. 174, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

⁷⁴ Ibid., “Unterbewertung, Unterbesetzung,“ Anlage o, Band III, seite 75R-76R, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

⁷⁵ Bekker, 136

⁷⁶ Newpower, 29

⁷⁷ Campbell, 262

As mentioned before, the magnetic field emitted by the target was influenced by the earth's magnetic field which itself was dependent upon the target's geographical position on the globe. The farther north it was, the stronger the influence of the earth's magnetic field was upon the ignition coil of the torpedo. Although this problem was anticipated by the *Zonenkarte*, the relationship between position and magnetic zone was complex, so that an error of as little as 30 miles could place the U-boat in a different zone, which would upset the careful balance of position and magnetic strength needed to pivot the detonator's dip needle into closing the circuit, and so cause detonation.⁷⁸

Geographical position was, moreover, not the only factor on which the magnetic field was dependent. One such factor were "magnetic storms," which were occasioned by extensive and powerful "sun spots" and indicated by the visual appearance of the Aurora Borealis. Significantly, such storms were especially prevalent from autumn 1939 until the spring of 1940, during which most of the premature detonations occurred. Finally, although the earth's magnetic field was generally constant, certain "interference areas" existed in which the strength of the magnetic field was significantly heightened. These areas were generally located near concentrations of volcanic rock, such as the coast of Scotland, or heavy concentrations of iron ore, such as that located by Norway.⁷⁹ Needless to say, the MZ pistol was predicated upon a constant magnetic field and took none of these factors into consideration. The result was an abnormally large number of premature detonations.

These factors were of course not known to the TI at the time, who continued to scramble for answers. As it turned out, Dönitz had been keeping especially close tabs on all the incoming reports from the September boats. By the beginning of October he had compiled this

⁷⁸ Stern, 80

⁷⁹ Bekker, 128

information into quite a dossier of premature detonations and erratic runs which he presented to the head of the navy, Grand Admiral Erich Raeder, along with the personal request that he order the Torpedo Inspectorate to conduct an exhaustive technical investigation of these failures. Raeder, who was likewise alarmed by the content of Dönitz' report, was happy to oblige his commander of U-boats and ordered the investigation. Almost immediately the TI revealed that tests had identified two flaws: a poorly designed cable layout in the torpedo's electric circuitry, and a vague and yet unidentified "mechanical flaw" that could account for some of the erratic runs.⁸⁰ The TI recommended changing the cable layout in the torpedoes and switching over in the meantime to AZ detonation only, which as we have seen was accomplished in the meeting of the 8th.

The results could not have impressed Dönitz, who must have felt that the TI had failed to probe deeply enough into the causes. Specifically, he was alarmed by certain reports from his captains of misses against targets occurring even in cases where exact firing data was known beyond a doubt. When fired from a good position, such cases could only be explained by the torpedo running underneath the target, as other sources of malfunction, such as a premature detonation or an erratic run off course, would have been noticed by the crew. The matter of depth had not even been mentioned in the TI's report. As it was, Dönitz had little choice but to accept the TI's recommendations and hope for the best.

With the installation of the new cable layout, permission was again granted in early October for MZ detonation. Whatever hopes the Navy may have had that this simple expedient would significantly improve the MZ disappeared on the night of October 17-18 when Herbert Sohler in U-46 attacked the convoy Homebound Gibraltar 3. Although Sohler was able to sink the 7,200 ton freighter *City of Mandalay*, he experienced seven torpedo malfunctions including

⁸⁰ Newpower, 43 Blair, 103 Rössler, *The U-Boat*, 83

four premature detonations and two surface runners.⁸¹ Certainly, the presence of these surface runners only added to Dönitz' conviction that the torpedoes' depth-keeping had been compromised. The effect of this report was predictable. Within twenty-four hours after receiving Sohler's transmission, and without consulting either the OKM or the TI, Dönitz again forbade use of the MZ.⁸²

One positive outcome of this decision was that it finally spurred the TI into confirming Dönitz' long held suspicions regarding the torpedoes' depth-keeping characteristics. Forty-eight hours after again forbidding use of the MZ for both the G7a and G7e, Dönitz received a message from the TI on October 20 stating that the torpedoes were liable to run up to 6.5 feet deeper than set.⁸³ This news was probably met with mixed emotion by Dönitz, who must have been happy to have his suspicions finally confirmed, yet no doubt also chagrined that such confirmation had not come sooner. What was particularly upsetting to Dönitz, however, was the report's admission that the TVA had in fact been aware of this problem for some years but had done virtually nothing about it since in their judgment the question of depth was of little importance for a torpedo armed with a magnetic pistol.

The story of how the TI finally became aware of the depth problem is an interesting one. Roughly a week after the meeting of October 8, Admiral Wehr sent a report to the head of the TI, Admiral Götting, recommending a fixed 3.5 meter depth setting for all the torpedoes. Although this would seem to imply that there was in fact a problem with the torpedo depth setting, the message made no mention of the extent, nor did it contain any additional data, or indeed ever explicitly state that the depth setting was in fact faulty. Lacking this information, Götting did not

⁸¹ Herbert Sohler, U-46 KTB *Schußunterlagen*, 17.5-18.5 1939, PG 30043, National Archives Microfilm Publication T1022, Roll 3116, 47-54

⁸² Blair, 113 Rössler, *Die Torpedos der deutschen U-Boote*, 83 Newpower, 44

⁸³ Blair, 114 Newpower, 44

forward this report to Dönitz, but rather cubby-holed it for later use. Nor did he bother to call Admiral Wehr to ask for further clarification.

This report was later to become a key point of contention between Admirals Wehr and Götting during the court martial proceedings which eventually followed. Götting leveled charges against Wehr accusing him of failing to mention the true extent of the depth problem with the “absolute required frankness” (*unbedingt erforderlichen Offenheit*). Wehr for his place claimed that this was not the purpose of the report, which was rather “to convey to the front how they might in their given state of affairs behave in order to avoid any military disadvantage.” Moreover, Wehr claimed that it was not necessary to provide the level of detail demanded by Götting as it was anticipated by the TVA that the TI would request additional information regarding any inconsistencies that may arise.⁸⁴

As things turned out, it was neither Wehr nor Götting who was finally responsible for bringing the true state of the depth problem to Dönitz’ attention. Rather, it was up to young Kattentidt, who was still troubled that nobody present at the October meeting had brought up the issue of depth. In any event, Kattentidt took the initiative to bypass his boss, Admiral Wehr, and communicated what he knew directly to the head of the TEK, Admiral Scherf, who in turn told Götting, who finally was able to tell Dönitz.⁸⁵

This revelation led to another meeting on October 20, during which Götting recommended to Dönitz that when using AZ detonation the torpedoes should be set at a depth of two meters less than the target’s draught. Wehr, however, was strongly against this proposal, since in his opinion it would be extremely difficult for a captain to accurately calculate the

⁸⁴ “Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures,” M. an TI vom 14.10.39 Vorschlag, Anlage r, 27.5.1941, PG 31057, Band II, seite 177-178, National Archives Microfilm Publication T1022, Roll 3467

⁸⁵ Bekker, 136

correct draught of the target, which he would now be required to do. For instance, Wehr said, were a commander to incorrectly calculate a draught of eight meters for an actual draught of six meters and set his torpedoes according to the TI's recommendation, then these torpedoes would be likely to run under the target. In place of the TI's recommendation Wehr again suggested a fixed depth setting of 3.5 meters for both the G7a and G7e.⁸⁶ Provided the torpedoes really did run two meters deeper than set, this would guarantee a hit on vessels with a draft of more than 5.5 meters, although it would miss targets with a draft of less. However, such was also the case with the TI's recommendation, since it was not possible to set the torpedoes to run less than three meters because in heavy seas there was a danger that the torpedo would become a surface runner.⁸⁷ Although Wehr did seem to make the better argument, in the end the TI's recommendation won out so that on November 1 the following radio transmission was sent out to the U-boats:

- 1). Torpedoes steer up to 2 meters [deeper] than set. Therefore depth setting is 2 meters less than targets draught, although because of the danger of surface runners not shallower than 3 meters, 4 meters in strong Atlantic waves.
- 2). Finishing shots on stopped steamers only depth setting 3.
- 3). No shots from ranges less than 300 meters.⁸⁸

In any event, these orders now put the U-boats in a very disadvantageous position, as it left the captains unable to shoot at anything with a draught of less than five meters, which included the U-boats primary enemy, the destroyer.

By way of a side note, it should be mentioned that this conference was followed three days later by another meeting on October 23 where it was finally acknowledged that torpedoes

⁸⁶ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, "M. an TI vom 14.10.39 Vorschlag," Anlage r, 27.5.1941, PG 31057, Band II, seite 177-178, National Archives Microfilm Publication T1022, Roll 3467

⁸⁷ Ibid.

⁸⁸ "Funkspruch von BdU," (Uhrzeitgruppe 1001/1/59, 1135/1/58, 1056/1/60), 1.11.1939, PG 30022/1-8, National Archives Microfilm Publication T1022, Roll 3027

fired with the MZ setting were likely to prematurely detonate, while those fired with the AZ setting were likely to run too deep. This double-headed monster, premature detonations and deep running, was to form the crux of the *Torpedokrise*. This of course basically just reaffirmed what was already known. The one positive outcome was that it resulted in Admiral Wehr instructing the TVA that same day to concentrate all resources onto removing these two problems.⁸⁹

As may be guessed, the news that they were now forbidden from attacking destroyers, even in cases of self defense, was met with dismay and resentment from U-boat skippers. Certainly this was the sentiment of Kapitän zur See (KzS) Viktor Schütze, captain of U-25, a future holder of the coveted Knights Cross, and one of Germany's top aces. He was cruising off the Spanish coast in the Bay of Biscay on November 5 at around 3:00 in the morning, when he spotted against a rain wall several dark clouds roughly 4,000 meters away, a sure indication of a convoy. Moments later the convoy's rearguard, a lone destroyer, came into view. She lay motionless in the water with her engines off, probably so that she could get better readings from her SONAR. Just 700 meters away Schütze also lay still. He was not worried about being detected, for against the inky black sky the tiny silhouette of U-25 made her all but invisible to the eyes of the British.⁹⁰

From Schütze's perspective, everything seemed perfect to venture a torpedo shot against this unsuspecting British destroyer. Everything was perfect that is except for the orders he had received from BdU on the 1st, which specifically forbade him from attempting such attacks on the grounds alluded to above. With these orders fresh in mind, Schütze put his resentments into the boat's war log while the destroyer gradually slipped away:

⁸⁹ Rössler, *Die Torpedos der deutschen U-Boote*, 83-84

⁹⁰ Viktor Schütze, U-25 KTB, 5.11.1939, PG 30022/1-8, National Archive Microfilm Publication T-1022 series, Roll 3027

The inability to use the torpedo despite a technically good position is very depressing. So I lay here helpless...The draught of the target is reckoned to be 3 meters. In the heavy seas the torpedo must be shot with 4 meter depth setting. Given the short running distance it is considered that the arming of the pistol [turning of the spindle on the pistol] may fail to occur in the event of a surface runner. A notice of the surface runner [by the English] will lead to the destruction of the boat.⁹¹

In any case, the frustration felt by Schütze on account of this incident was likely no more than an annoyance compared to what had happened to him just five days earlier, on October 31, a day which may well have been the most embarrassing in the otherwise distinguished history of the *U-Bootwaffe*.

Events started out well enough. Cruising Northwest of Cape Villano, at approximately midnight Schütze encountered a small convoy escorted by six to seven destroyers. After carefully maneuvering himself around the escorts he managed by 5:20am to get into a favorable position for a shot on the first two steamers, and fired two torpedoes from a distance of 2,000 meters. Not wanting to wait around for the destroyers to react, Schütze took the boat to fifty meters' depth to wait for what he hoped would be the sounds of his success. Two to three minutes later he heard it: two clear detonations, a definite hit! U-25's luck continued to hold. The inevitable counter attack by the escorts, which occurred roughly an hour later, was poorly conducted, the depth-charges exploding at too great a distance to inflict any damage on U-25. Schütze remained on the bottom for the next six hours, slowly maneuvering himself away from the rest of the escorts who had by now gathered in the vicinity to rescue the crew of the stricken steamer.

Scanning the horizon and seeing nothing but blue sea and clouds, Schütze surfaced U-25 at 16:20 hours and set off to regain contact with the convoy that had slipped away during his time on the bottom. Initially the boat continued to enjoy good fortune, for just four hours later

⁹¹ Ibid.

another steamer was spotted, sailing independently and bearing the markings of a belligerent nation. As there was no escort to be seen, it was necessary to treat her in strict accordance with the *Preisenordnung*. Schütze accordingly took U-25 aside the steamer, which had by now come to a complete stop, as if having recognized the futility of attempting to escape, and sent her the following signal: “1) Do not use wireless. 2) Where do you go? 3) Send boat with captain and papers or you will be torpedoed.” It would seem, however, that the steamer’s captain had apparently had a change of heart, for instead of responding as ordered, the steamer suddenly lurched forward again as if to continue on her original course. From this point on everything went wrong. Schütze, interpreting the steamer’s attempted flight as an act of passive resistance, responded by firing two torpedoes at the steamer, both of which malfunctioned. Schütze’s display of aggressiveness had however apparently spooked the steamer’s crew, for they quickly identified themselves as Yugoslav and again hove to, at which point Schütze instructed them to get into their boats. This done, Schütze fired a third torpedo at the now stopped steamer from a distance of 5,600 meters, which again malfunctioned. Schütze wrote in his log that he thought this torpedo had actually hit the steamer, but had failed to detonate. Still resolute, Schütze fired yet a fourth torpedo. The result: a surface runner that malfunctioned and ran off course, missing the target completely. Disgusted with his torpedoes, Schütze decided to dispatch his stubborn prey with gunfire from U-25’s deck gun, but when the crew went to service the piece it was found that the weapon was jammed shut and despite the best efforts of the crew, would not move open. What Schütze had to do now, although entirely understandable given the circumstances, was one of the most embarrassing acts he would ever commit: “Since a further attempt of the torpedo did not seem justified,” he later wrote in his war log, “the attack was given up...the

failure of four torpedoes and the impossibility of using the deck gun robbed us of sinking the target and led to an unhappy act that cost us prestige. . .”⁹²

To quickly sum up the day’s events: Schütze had stopped a lone steamer with the intent to sink her, forced her crew off the boat and into their life rafts, and then in their full view had repeatedly tried without success to sink their motionless vessel before giving up and going home. Certainly when we imagine the faces of the steamer’s crew, who oblivious to Schütze’s predicament could only watch in puzzlement as the feared German U-boat tried without success to sink their defenseless ship, the day’s events begin to take on a comic aspect. It was a play starring one of Germany’s most illustrious U-boat aces, and by extension the entire *U-Bootwaffe*, as a hapless protagonist who tries without success to complete the simplest of tasks before a baffled audience of floating Yugoslavs.

Meanwhile, far away to the west of the Orkneys, another U-boat captain was undergoing an ordeal that, although certainly not as embarrassing on the personal level as Schütze’s misadventure, would have far greater consequences not only for the *Torpedowaffe* but perhaps also for the entire course of the war.

Twenty-nine year old Korvettenkapitan Wilhelm Zahn commanded U-56, one of the small type II coastal boats that rolled so heavily in the open sea that they earned the derogatory nickname “dugout canoes,” or more simply “ducks.” It was not an enviable command, as nobody wanted to serve on a duck. Their tiny size relegated them to operating close to shore, ensuring that they never had the opportunity to distinguish themselves the way the larger Type VII and IX Atlantic boats could. It also earned them a reputation as being flimsy, unreliable craft, and in an era when no German submarines were noted for their special comforts, far too cramped to live in.

⁹² Entry of October 31, 1939, *ibid*.

Zahn therefore did not expect very much when on October 30 the radio room reported hearing “muffled, indefinable noises to the north.”⁹³ Probably just another flotilla of fishing vessels – the most common sight that might be expected this close to shore. Nevertheless he dutifully ordered the helmsman to steer the tiny craft in the direction of the noise, and carefully scanned the horizon from his periscope. Suddenly, three battleships came into view, heading straight for his position. Not entirely convinced that his eyes were not simply playing tricks on him, Zahn looked again, but the steel monsters were still there. Zahn’s body tingled with excitement mixed with frustration. It was a rare occasion indeed for any commander, let alone the skipper of an insignificant duck, to be presented with such an opportunity, but the fact that the ships were coming at him bows on presented him with a frightfully small target.

Suddenly, while he was deliberating the odds of chancing such an attack, the three ships began to turn, dramatically increasing Zahn’s chances as he could now shoot at them abeam rather than head on. Zahn wasted no time ordering the attack. Soon three torpedoes were on their way, racing towards the second battleship, the HMS *Nelson*. Inside U-56 a deathly quiet, punctuated only by the sounds of the 1 WO stopwatch, reigned as the crew waited with bated breath for what they hoped would be the sounds of explosion and twisting metal. For a while all that could be heard were the thrashing noises of *Nelson*’s propellers churning the sea. Then suddenly there was a sharp CLANG, followed soon after by another, of iron hitting iron.⁹⁴ Then all was silent once again except for the sound of *Nelson*’s propellers.

For what seemed like forever Zahn and his crew stared at each other in disbelief. It was obvious what had happened; only what had happened could not have happened, it was simply

⁹³ Bekker, 122

⁹⁴ Ibid., 122-123

inconceivable. Nobody on U-56 wanted to admit that they had just heard the sound of their torpedoes actually *hitting* their target, yet failing to detonate.

But sometimes the impossible does happen, and for the British it was a very lucky thing that it had happened when it did, for that day the *Nelson* played host to a very distinguished group of visitors. Inside one of her many compartments, the captain's cabin probably, Admiral Sir Charles Forbes, Commander in Chief Home Fleet, was discussing the present state of security of the Royal Navy's main bases at Scapa Flow, Loch Ewe, and Rosyth. Seated at the table with him was the First Sea Lord, Admiral of the Fleet Sir Dudley Pound, as well as the then First Lord of the Admiralty, Winston Churchill.⁹⁵ The funny thing of the scenario of course is that neither party – the grand heads of the entire Royal Navy and Zahn's tiny crew in their midget sized submarine – was even aware of the other's presence. *Nelson* had no idea that she had in fact been hit by two torpedoes; Zahn had no idea that he had in his tiny little duck come perilously close to decapitating the heads of the Royal Navy.

The story is one of the great “what ifs” of the war, but like the subject of this study, one that few people are aware of. Who can say what would have happened if Zahn's torpedoes had in fact detonated. Would *Nelson* have sunk after being hit with two torpedoes? Would Churchill, Pound, and Forbes have survived the incident, picked up by one of the accompanying destroyers perhaps, or would they have perished? And if they did, given the later disasters of the loss of Norway, the fall of France, and the blitz, would England have had the will to stay the course and fight on without the charismatic leadership and bulldog determination of Winston Churchill, or would she have accepted Hitler's later overtures for peace the following year? If so, would Hitler in fact have won the war? These questions of course are pure speculation, ones to which we will never know the answers. All that can be said is that Churchill, Pound, and

⁹⁵ Kurowski, 364 Bekker, 123

Forbes were discussing matters on board *Nelson*, Zahn fired three torpedoes, and at least two of these hit. The rest is up to the imagination of the reader.

As it was, the events of October 30 were it for Zahn. His tiny duck, being the slow unwieldy thing it was, could not catch up again with the British ships. He spent another ten fruitless days cruising around the area before finally returning home to Wilhelmshaven on November 10, in an utter state of dejection. So depressed in fact had this incident made him that after receiving his report, Dönitz decided he was not fit to return to sea and relieved him from further frontline duties. He would remain in a shore position until August 1941, when he was given command of U-69 and allowed to set out again to sea.

Needless to say, Dönitz was little pleased by the reports of U-25 and U-56. With evident frustration he wrote the following day, October 31, in his war diary:

The problem of torpedo failures is unfortunately still far from being solved. U-25 reports 4 failures at one stopped ship, shots at short range. The Torpedo Inspectorate's instructions were observed. There is therefore no longer any doubt that the Torpedo Inspectorate themselves do not understand the matter. At present torpedoes cannot be fired with non-contact firing units, as this has led to premature detonation. Their depth setting has to be 2 meters less than the draught of their target. Their depth may not be less than 3 meters, as otherwise there may be surface runners in which especially the engines of the G7a may be damaged. Exact instructions are given for setting the safety range and these are observed. Nevertheless at least 30% of the torpedoes are duds. They either do not detonate at all or they detonate in the wrong place. There does not seem to be any sense in issuing new instructions to the boats as they never lead to the desired results. The Commanding Officers must be losing confidence in their torpedoes. In the end their fighting spirit will suffer. The torpedo failure problem is at present the most urgent of all the problems of U-Boat warfare.⁹⁶

Dönitz' frustration is quite understandable. Apparently, in addition to premature detonations and faulty depth-keeping, he now had to worry about whether the torpedoes would even explode if they managed to hit the target. As with the crew of U-56, the thought of a torpedo striking its target yet failing to explode seemed surreal.

⁹⁶ Dönitz, FdU/BdU KTB, 31.10.1939, PG 30250, National Archives Microfilm Publication T1022 series, Roll 3979, 48

There was of course a logical explanation, although it would take time before it became apparent. The root of the problem lay with the impact pistol's design. As mentioned before, the Pi G7A AZ type was based on the older impact pistol of the previous war, which had been detonated by the simple yet reliable method of striking the target's hull. This however had been modified to such an extent during the interwar years that detonation was now achieved through a far more complicated process. The impact was now conveyed through four "whiskers" attached to the torpedo's head "to a long, thin, multi-bearing rod, redirected by double levers," which eventually set off the detonation from the rear. But depending upon the angle by which the torpedo struck the target, the delicate rod could bend and hence fail to convey the impact.⁹⁷ Initially it had been specified by OKM that ignition was to be guaranteed at an impact angle of twenty-one degrees and over, but disturbances encountered by the torpedo during its run meant that this was not always so. Additionally, torpedoes which struck the target at an angle of less than twenty degrees simply failed to detonate. Eventually, improvements to the whiskers design would reduce the necessary angle of impact to six degrees by the middle of 1940.⁹⁸

For the time being, however, the bad news continued to pour in. On November 7 Sohler put into port after a four week patrol during which U-46 had continuously been in and out of convoys on three separate occasions. Not surprisingly, despite good shooting conditions, he had experienced several failures, for example against a wall of overlapping ships, and against a stationary cruiser. All in all Sohler reported seven failures during a patrol in which "the boat could have sunk 30-40,000 tons; [but] she actually sank 5,000."⁹⁹ Relating to the morale of the

⁹⁷ Bekker, 127

⁹⁸ Rössler, *Die torpedos der deutschen U-Boote*, 76

⁹⁹ Dönitz, FdU/BdU KTB, 7.11.1939, PG 30251, National Archives Microfilm Publication T1022 series, Roll 3979, 51

crew, Dönitz went on to say that “several patrols like this will turn keenness into indifference, if all efforts are to no purpose.”¹⁰⁰

Other commanders also continued to experience frustration. Shortly after his embarrassing episode with the Yugoslavs, Schütze experienced difficulty once again during an attack on two vessels in early November. Against the first ship he experienced another four contact pistol failures before finally sinking the ship. Against the second, which he decided to sink with his deck gun – he had apparently got it to work in the meantime – the gun’s recoil had cracked the torpedo loading hatch which forced him to return home.¹⁰¹

Schütze’s second set of failures sparked a wave of anger in both OKM and with Dönitz that resulted in Raeder ordering yet another technical investigation by the TI, who oddly enough was able to respond with some good news. Recently the TVA had claimed that it would be possible to remove the danger of premature detonation by muffling the coil of the MZ ignition relay. Assuming this worked as claimed, improvements to the AZ could wait as the boats would now possess a far more effective weapon with a reliable MZ detonation option. The prescribed alterations immediately went into effect, and the new altered pistol was given the designation Pi a+b. Although he personally doubted the TVA’s claims, given the circumstances Dönitz felt he had little alternative but to accept the TI’s recommendation to reopen MZ firing. Thus on November 8 he gave permission to all boats to use MZ detonation, but not with the G7a fast-shot *Schnellschusse*. The depth was to be set at the target’s draught plus one meter.¹⁰²

Thus for the third time in roughly two months the crews had received their third set of contradictory orders. First they were forbidden to use the MZ with the G7a torpedo. Then this was broadened to include the G7e, which had effectively ended any use whatsoever of the

¹⁰⁰ Ibid.

¹⁰¹ Blair, 115 Newpower, 44

¹⁰² Rössler, *Die Torpedos der deutschen U-Boote*, 84

MZ option. Now, the crews were told to go back to firing the MZ. What on earth, they may have wondered, were their superiors thinking? As time would show, these orders would change many more times before the problem was resolved.

On November 14 Dönitz was visited by Professor Cornelius of the Technical University of Berlin. The primary designer of the G7a torpedo, as well as a major figure in the development of the G7e, as well as of the pistols, Cornelius was viewed as the leading expert in Germany in all matters pertaining to torpedoes. He was greeted by a stream of bitter recriminations from Dönitz, who presented him with a detailed summary of the torpedo difficulties up to this point and demanded to know what he was supposed to do from here on? Cornelius of course could not provide any immediate answers, but he at once set about getting to the bottom of things. A few days earlier he had been nominated by Raeder to the newly created position of “Torpedo Dictator” and tasked with three responsibilities: 1) to eliminate the faults in the pistols, 2) to ensure that the torpedoes would keep perfect depth, 3) to ensure adequate production.¹⁰³ As the title suggests, to achieve these ends he was given wide-ranging and near absolute powers over all the branches of the *Torpedowesen*, powers that he now put to use in establishing the *Arbeitsgemeinschaft Cornelius* (AG Cornelius, abbreviated AGC), a new agency composed of the brightest minds from the private sectors of research and industry that was to take a leading role in investigating and removing the torpedo difficulties.¹⁰⁴

Dr. Cornelius’ appointment and the creation of the AGC was a move completely without precedent, and as such is a clear indication of both the Navy’s determination and desperation to solve the torpedo problem. For the first time in history a major department of the Navy had been taken away from the military and placed exclusively under civilian control. To the personnel of

¹⁰³ Dönitz, FdU/BdU KTB, 14.11.1939, PG 30251, National Archive Microfilm Publication T1022 series, Roll 3979, 54

¹⁰⁴ Rössler, *Die Torpedos der deutschen U-Boote*, 84

the TI, it was clearly a message that they had completely failed in their assignment of creating a reliable torpedo and a warning that mistakes would not be tolerated in the future.

Dönitz' doubts of the effectiveness of the Pi a+b were soon confirmed by the experience of KptL Curt von Gossler and U-49. Sailing off the Iberian Peninsula on November 19, von Gossler encountered the 7,000 ton freighter *Rothsay Castle*, escorted by two destroyers, HMS *Echo* and *Wanderer*. The situation was hardly ideal for an attack as there was only one target, and the two escorts could attack U-49 immediately should any of her torpedoes prematurely detonate. Fully aware of his disadvantage, von Gossler nevertheless decided to attack. At 0647 hours he fired a single G7a armed with the new Pi a+b, depth nine meters. The result was as feared: the torpedo exploded at the end of its security run, 200 meters away from the boat. Fifteen minutes later von Gossler followed this with a double fan shot of G7e torpedoes with the Pi a+b pistol, depth also nine meters. Four minutes and five seconds later both of these torpedoes detonated 600 meters wide and to the rear of the freighter after a run of 2,000 meters. As von Gossler noted in his log, both of these torpedoes had been fired with exact data and had received the required daily care. A fourth attempt eight minutes later with another G7e with the same pistol and depth setting was likewise unsuccessful. Unlike the previous three however, this torpedo failed to detonate altogether. Noting also the plummeting morale of his crew following these premature detonations, von Gossler wrote in his log that "The torpedoes were handled exactly according to the instructions, their failures are to me not understandable. What must the English think of all these explosions?"¹⁰⁵

Apparently the English had made much of the explosions that suddenly popped up all round their vicinity. The *Rothsay Castle* immediately turned in the direction of U-49 and

¹⁰⁵ Curt von Gossler, U-49 KTB *Schussmeldungen*, 19.11.1939, PG 30046/1-4, National Archives Microfilm Publication T 1022 series, Roll 3029,

opened fire with a small caliber gun mounted on her deck. The two escorts, *Echo* and *Wanderer*, alerted to U-49's exact position courtesy of her premature detonations, moved in for the kill. For several hours they pounded U-49 with depth-charge attacks, forcing the boat to dive to a horrifying depth of 557 feet to escape the blasts. Eventually, either believing their work to be done or else having run out of depth-charges, the destroyers backed off. It was a lucky break for U-49, which had been badly shaken by the blasts and could not endure much more. With most of her battery power gone and her air going stale, von Gossler surfaced soon after the destroyers left and immediately radioed a message to Dönitz informing him of the incident.

Dönitz was initially inclined to give the pistol the benefit of the doubt. "U-49 reported a premature detonation with the adapted pistol," he wrote the next day in his war log. "This is so far an isolated case and no judgment can be made."¹⁰⁶ Unwilling to immediately write off the pistol, Dönitz initially attributed the failures to the bad weather that was so prevalent this time of year. Heavy seas could for instance cause a torpedo to run shallower than set as it is bounced amongst the choppy waves, just as the force of these waves working on the spinning armature in the pistol's head could inadvertently trigger a premature detonation. In the early December entries into the FdU/BdU war diary for instance the poor weather is frequently mentioned. Dönitz therefore ordered that torpedoes be fired with an increased depth setting. Other minor suggestions by the TI, such as isolating the copper cap on the pistol, smoothing the pressure disc, etc, were also incorporated.¹⁰⁷ Considering that several of the reports of premature detonations and non-detonations received by Dönitz, such as with U-49, occurred in light to moderate sea conditions, it is not altogether clear why Dönitz would suspect the weather. More than likely he

¹⁰⁶ Dönitz, FdU/BdU KTB, 19.11.1939, PG 30252, National Archive Microfilm Publication T1022 series, Roll 3979, 58

¹⁰⁷ Rössler, *Die Torpedos der deutschen U-Boote*, 84

wanted to give the new pistol adequate time to prove itself and was therefore loath to pull it at the first sign of trouble.

Eventually as more and more reports of premature detonations and non-detonations continued to roll in it became harder to blame everything on weather conditions. U-41, for instance, reported a total of nine failures in eleven shots during one November patrol.¹⁰⁸ On 7 December Dönitz wrote that U-29 had experienced a number of unknown failures with torpedoes armed with the old type of pistol.¹⁰⁹

A quick overview of Prien's third patrol, lasting from November 16 to December 18, will serve as a good illustration of the typical problems a U-boat commander faced even after the introduction of the Pi a+b. Like so many others, the patrol started well. On November 28 Prien had encountered a British cruiser, the HMS *Norfolk*, and attacked her with a single torpedo with the improved pistol. He was in the process of making ready a second torpedo when a sudden swell turned his boat halfway around, taking her out of position. While this was happening he heard a definite detonation – a hit! His initial view of the cruiser when he finally got the boat righted seemed to confirm this. The *Norfolk* appeared to be heavily damaged, her backside a mass of twisted metal and her reconnaissance plane leaning off her starboard side. The weather prevented him from getting off another attack, but Prien reported home all the same that he had scored a definite hit on a British cruiser. When the Nazi propaganda machine got a hold of the story they immediately claimed that the “Bull of Scapa” had sunk yet another English warship and had broadcast the news all across the *Reich*. Actually, as was confirmed later by the *Norfolk*, the cruiser had not been damaged at all. Prien's torpedo had actually detonated prematurely in *Norfolk's* wake. The damage Prien thought he had seen had been an illusion occasioned by the

¹⁰⁸ Blair, 119

¹⁰⁹ Dönitz, FdU/BdU KTB, 7.12.1939, PG 30253, National Archive Microfilm Publication T1022 series, Roll 3979, 66

weather. Although the BBC corrected the story, radio Berlin persisted in their claim that Prien had sunk the *Norfolk*, elevating Prien to even higher fame.¹¹⁰

Things seemed to go well on December 5 when Prien successfully attacked and sunk a steamer with a single torpedo. The following day, the 6th, he had found himself amidst a convoy and successfully attacked a second steamer at 2029 hours, which exploded into flames after being struck by a single torpedo. Things then started to go downhill. At 2230 hours he attacked another steamer in a different convoy with a single torpedo, which exploded at the end of its security run. Another shot fired immediately after the first ran under the target and never detonated. Prien encountered further traffic the following day. “I am like a flying [*Bettsack*]” he wrote, “jumping from convoy to convoy.”¹¹¹ At 0524 that morning he scored a hit on another steamer, which lit up the sky in a maelstrom of flame. The 8th and 9th were days of rest while Prien searched for another pack of ships to attack. On the 10th Prien finally found a target, an unsuspecting destroyer, which he attacked but with no success. The torpedo ran under as he suspected. The next day, the 11th, the action continued.

At midnight, “Light in sight . . . it appears to be a fishing boat . . . suddenly a freighter turns broadside...attack undertaken . . . tube 5 FIRE! Position 90, course 11, distance 7hm, bow right, depth 6 meters, MISS! . . . The steamer has reduced speed and again put out her directional lights. It appears to now be two steamers, which lie perpendicular to the wind. New run, tube 2 FIRE! Position 100, bow right, distance 5hm, torpedo course 308 degrees, depth 5 meters, MISS! New approach from port. Tube 4 FIRE! Position 100, bow left, distance 4hm, speed 5sm, torpedo course 60 degrees, enemy course now 0 degrees, depth 4 meters, MISS!...It is to the devil with these torpedoes! In the course of the afternoon we are again depth-charged. 1400 hours a neutral on our course. On horizon a destroyer. Is this a submarine trap? . . . Light in sight! Steamer without markings. Attack undertaken . . . 3Tube 5 FIRE! Depth 6 meters, position 70, bow right, distance 5hm, speed 10sm, torpedo course 121 degrees, MISS! New run, tube 3 FIRE! Position 80, speed 10sm, distance 3hm, depth 4m, torpedo course 112 degrees. MISS! And they say we should not become angry! In the future I would do without these damn Etos!¹¹²

¹¹⁰ Blair, 117

¹¹¹ Günther Prien, U-47 KTB, 6.12.1939, PG 30044/1-11, National Archives Microfilm Publication T1022 series, Roll 2970,

¹¹²Entry of December 11, 1939, *ibid*.

Prien's luck continued to go south the next few days. On the 12th he recorded another two misses, this time with impact pistol as he appears on his own initiative to have stopped using the magnetic detonation. Speculating on what could possibly be causing all these misses, Prien and his first Officer, Lt. Endrass, wrote that "we suspect that the Eto is running too slow, as a result of which it steers too deep and reduces the depth setting almost to the minimum . . . A second possibility can perhaps be found that the Eto on an East West course can so strongly influence the pistol through its own magnetic field that the detonation on the target no longer takes place, because the magnetic field of the torpedo outweighs the magnetic field of the target."¹¹³ Although this contention was almost certainly wrong in detail, Prien and Endrass were nevertheless correct in assuming that the torpedoes were running too deep and that variances of the magnetic field were in fact playing havoc with detonation.

Finally on the 18th U-47 arrived home at Kiel. The patrol, especially in its latter stages, had been a complete failure. The "Bull of Scapa" had fired a total of fifteen torpedoes, only three of which had hit. The patrol had culminated, moreover, with this highly decorated captain firing eight consecutive misses, all despite solid data. Although not every captain would have such miserable luck with torpedo failures on patrol, the fact that the captain in question was none other than Günther Prien certainly makes the tale that much more interesting in that it emphasizes the lack of correlation between torpedo failures and personal skill. A fabulous captain such as Prien might experience eight misses in a row, while a "green" captain on his first patrol might get away with minimal failures. It was, at least in appearance, completely random. Expressing no doubt the sentiment of many a U-boat commander, Prien summed up the patrol by

¹¹³ Entry of December 11, 1939, *Schußunterlagen*, *ibid.*

stating “the entire operational orders of the course around the Shetlands has lost all sense as a result of the shortcomings in the torpedoes.”¹¹⁴

Although he still allowed its use, further patrols such as Prien’s made it increasingly clear to Dönitz that there was a lot more to the new pistol’s problems than bad weather. Despite the repeated assurances of the TI, it was obvious that the magnetic pistol still had numerous problems as yet unknown to the TI. “One thing is certain now, however;” Dönitz wrote in his war log on December 11, “The steps which the Torpedo Inspectorate promised themselves would remove the cause of these failures have not led to the desired results.”¹¹⁵

New Leadership for a new year: The Arrival of Vice Admiral Kummetz (December 1939)

By this time the OKM had had enough of the TI’s excuses and promised solutions that failed to lead anywhere, and decided it was time for a change of leadership. Roughly a month before, on November 17, *Konteradmiral* Oskar Wehr had been sacked and *Kapitän zur See* Kurt Utke was given his post of head of the TVA. Now it was Götting’s turn. On December 21 Götting was ousted and *Vizeadmiral* Oskar Kummetz was made the new Torpedo Inspector.¹¹⁶ Kummetz immediately tackled his new assignment with a drive and energy that had previously been lacking. Just days after his appointment, Kummetz had conducted a series of tests at Eckernförde that “officially” proved that the torpedoes were in fact defective.¹¹⁷ Although this did not tell Dönitz anything that he did not already know, it was at least a step in the right

¹¹⁴ Entry of December 15, 1939, *ibid.*

¹¹⁵ Dönitz, FdU/BdU KTB, 11.12.1939, PG 30253, National Archive Microfilm Publication T1022 series, Roll 3979, 67

¹¹⁶ Axis History Factbook, “Kriegsmarine Units,” <http://www.axishistory.com/index.php?id=10675> (accessed May 29, 2010).

¹¹⁷ Blair, 136 *Newpower*, 46

direction for the Torpedo Directorate, which had hitherto attributed cases of torpedo failures as due more to the supposed “poor shooting” of the commanders than to inherent flaws in the design. In other words, the tests brought about a unity of purpose between the operational and technical branches, who could now work together in solving the problem rather than against each other, as had too often been the case.

Soon Kummetz had presided over a number of improvements in torpedo design. The propensity of the MZ to detonate prematurely was somewhat decreased through the installation in the detonating relay of a vibration-resistant suspension (*schwingungsunempfindliche Aufhängung*), aka a “rubber band.”¹¹⁸

By the end of December 1939 improvements to the existing depth-keeping device (*Tiefenapparat*) had resulted in the creation of the TA 1, which although certainly not perfect (difficulties of depth would persist until the removal of the final problems in early 1942), was certainly a marked improvement over the previous system. The TA 1 was essentially a system of five modifications to the previous TA: an enlargement of the depth plate from 30 to 42 mm and a corresponding enlargement of the depth spring, an enlargement of the pendulum deflector (*Pendelausschlages*), a semi-rigid coupling between the depth plate and pendulum (*halbstarre Kopplung zwischen Tiefenplatte und Tiefenpendel*), relief of the transmission shaft (*Entlastung der Übertragungswelle*), attenuation of the steering machine and enlargement of the rudder deflector (*Dämpfung der Steuermaschine und Vergrößerung der Ruderausschläge*).¹¹⁹

It will be recalled that from the outset of the war individual captains experienced great trouble with the actual run of their torpedoes. Entirely separate from the problems of depth or premature detonation, a torpedo fired one direction might suddenly veer off course or even in

¹¹⁸ Rössler, *die Torpedos der deutschen U-Boote*, 84

¹¹⁹ *Ibid.*

certain rare cases loop back around to strike the attacking U-boat. Assuming that the torpedo did run straight, a shaky run resulting from outside disturbances could in certain instances work against the armature and potentially contribute to a premature detonation. It was found, however, that such disturbance could be greatly reduced by replacing the previous four-bladed propeller with a new six-bladed propeller. This transition enabled the torpedo to run more smoothly in the water and hence improve its accuracy and stability.¹²⁰

Unfortunately, while the preparatory work on these improvements was achieved within a short period of time, the holding of actual trials and shooting exercises was delayed considerably until May 1940 due to the unusually cold winter, which froze over the Baltic shooting ranges at Eckernförde. As will be seen, this was to have particularly disastrous consequences for the *U-Bootwaffe*, as ice related delays meant that the U-boats would not receive these weapons until *after* the critical fighting around Norway during Operation *Weserübung* – the code name for the occupation of Norway and Denmark.

Thus ended the first year of war. On the surface, statistically speaking, the results had been most impressive considering the minuscule number of U-boats actually engaged. By Blair's calculations for 1939 (and the calculations do vary tremendously from one source to the next), 147 ships now lay at the bottom of the sea.¹²¹ Despite the numbers, however, the *U-Bootwaffe* was dejected and worn down. Against the damage they had inflicted a total of seventeen boats had been lost in the first seven months of war, a total of 30 percent of the force.¹²² Although this was partially offset by the construction during this period of eight new boats, it still represents a net loss. Moreover, as we have seen, the shaken trust in their weapons

¹²⁰ Ibid.

¹²¹ American Merchant Marine at War, "Battle of the Atlantic Statistics," <http://www.usmm.org/battleatlantic.html> (accessed June 29, 2010).

¹²² Blair, 144

resulted in a slow but steady demoralization of the crews that only increased with each premature detonation, with each miss, with each target that got away. However, there was reason for optimism. The recent changes in personnel made by Raeder had laid the groundwork for improvement by removing the unfit and replacing them with men of energy and optimism. In just a short time Kummetz had already identified several of the main flaws with the torpedoes and had begun work on their correction.

Although the TI had from the beginning proposed numerous temporary solutions – none of them to any effect – in general the work had been so ill coordinated and ad-hoc that the year of 1939 can best be thought of in terms of first recognizing and identifying the problem, and then convincing others of its existence and so getting everyone together on the same page. The next seven months of 1940 would be the period in which the most was done to actually bring about positive, noticeable change. Finally, although the Germans did not yet know it, all of this was occurring in the framework of a gigantic race against a clock of Allied innovation. The Allies were still new to the game (as were the Germans), but so far the Germans had done a much better job of playing it, their poor weapons technology aside. The challenge to Dönitz, OKM, the TI, TVA, and all the other affiliated persons and agencies was to first perfect their torpedoes and then use them to win a decisive victory within this window of Allied inexperience. The race was on.

The year 1940 began with Kummetz conducting numerous additional tests under difficult conditions in the first half of January that resulted in an eight percent rate of premature detonation and an additional 6.5 percent in which there was a danger of premature detonation.¹²³ These findings, coupled with additional reports of torpedo failure, led to another conference on January 17 in Wilhelmshaven. The point of the conference, which was attended by BdU and

¹²³ Rössler, *Die Torpedos der deutschen U-Bote*, 84

representatives of the TEK, was to discuss Dönitz' suspicion that the MZ could fail to explode even if shot under the target. As evidence Dönitz cited the experiences U-47, U-24, U-15, U-20, U-59, and U-60, who had all reported misses of shots fired at very close range with good firing data. As these had all been fired with the MZ setting, the only explanation could be that the torpedo had passed under the target as it was supposed to but that the MZ for whatever reasons had failed to detonate when it neared the target's magnetic field. Predictably, the representatives of the TEK were at a loss as to how to explain these incidents, and attempted to place the blame on the individual commanders, who, they said, must have vastly overestimated the target's weight and draught, which would lead to the torpedo travelling far deeper than it was supposed to and hence accounting for the failure to fire. Dönitz was not convinced, and again took his frustration out in the war diary:

I cannot believe that with a whole series of failures of this kind, [that] there are other reasons in every case . . . up to now I have believed that in many cases boats have fired past, due to misinterpretation of the firing data or aiming mistakes. In individual cases I have sent the boat for further training. But now, with these failures of shots fired under the most simple conditions by a series of the best trained Commanding Officers and torpedomen, I cannot accept this explanation any longer.¹²⁴

The TI's motivation in making such accusations, Dönitz went on to say, is "because the reason for the possible failure [is] not known and could not therefore be made to apply" – essentially they were attempting to camouflage their own ignorance of the matter.¹²⁵

Not surprisingly, the meeting resulted in yet another set of operating orders regarding the use of the MZ, which were immediately sent out to the fleet. Against targets of less than 4,000 tons, boats were now to adapt a depth setting of four meters. Against targets under 1,000 it was simply to be accepted that there was a good chance that the torpedo would not detonate. Against

¹²⁴ Dönitz, FdU/BdU KTB, 17.1.1940, PG 30256, National Archives Microfilm Publication T1022 series, Roll 3979, 77

¹²⁵ Ibid.

all other targets the U-boats were ordered to use a depth setting of the ship's draught plus one meter.¹²⁶

Four days later Dönitz' theories were proven correct. On the 21st he received a telephone call from Kummetz who reported that a series of trial shots made against an old vessel, the *T-123*, had indeed failed to detonate, and that magnetic measurements taken of the torpedoes in storage had revealed magnetic emissions emanating from the torpedo's hull. In line with Prien's and Endrass' theory proposed on December 11, the TI suggested that too strong or too weak an emission from the torpedo could either cause it to prematurely detonate or else offset the magnetic field of the target, causing it to fail to detonate altogether. As a result, it was decided to degauss all the torpedoes lying in storage.¹²⁷

In the meantime, while further research and development was still ongoing, the TI sought to improve the weapon they already had as best they could. March 1940 especially was a time of tinkering and adjustments to the Pi a+b MZ pistol. On March 14, for instance, a new set of recommendations regarding the *Zonenkarte* was sent out to BdU, to the various TI agencies and to fleet commands warning that considerable magnetic influence in the areas east of 30 degrees longitude must be expected with the result that the MZ was forbidden in these areas.¹²⁸ Five days later, in view of minimizing the danger that during a fan shot a premature detonation of one torpedo might also spark the detonation of the others, a new set of operating orders for the Pi a+b was issued by the TI. From here on the *Schnellschuss* (the highest speed setting of the G7a) was forbidden. Additionally, to prevent premature detonations from accidentally revealing a boat's position, only the AZ setting was to be used in cases where it was absolutely necessary for the

¹²⁶ Rössler, *Die Torpedos der deutschen U-Boote*, 85

¹²⁷ Dönitz, FdU/BdU KTB, 21.1.1940, PG 30256, National Archives Microfilm Publication T1022 series, Roll 3979, 78

¹²⁸ "Torpedoinspektion Abschrift Betrifft: Zonenkarten der Pi-Bed. Vorschrift Ausgabe," B.Nr Gkds. 468T, 14.3.1940, PG 34636, National Archives Microfilm Publication T1022, Roll 2347

boat to remain hidden. However, should the boat's position become compromised, permission was given to use the MZ.¹²⁹

On the surface this sounds confusing. When, one might ask oneself, was it ever *not* necessary for the U-boat to remain concealed during an attack? Although the answers are not included in the orders, it would be logical to guess that the orders requiring use of the AZ would apply to cases in which the boat was attacking by itself one or more targets which were guarded by escorts, for it was in such cases that a premature detonation would spell the greatest danger to the boat. By way of contrast, during a nighttime convoy battle when the sky would be filled with the flames of torpedoed merchantmen and punctuated by the sounds of explosions, the danger posed by a premature detonation would not be nearly as great, as it would be indistinguishable from the surrounding scene.

During these situations in which the MZ might be used, a depth setting of the ship's draught plus one meter was to be used. In part to prevent a premature detonation from causing any damage to the boat, as had happened earlier with U-27, a security run of no less than 500 meters was prescribed, instead of the previous run of 200 meters. To prevent one premature detonation from detonating other torpedoes, all fan shots were now to be fired with nine second intervals between torpedoes. Double shots were forbidden. Against targets of less than 4000 tons and against destroyers, a depth of four meters was to be used.¹³⁰

Reflecting the new pistol's increase in production, it was decided the next day to immediately begin equipping surface ships with the Pi a+b. This process was to proceed gradually, however, as it was always necessary for emergency purposes to maintain a constant stand of one hundred Pi a+b's at every *Torpedoresort* in case their use by U-boats was suddenly

¹²⁹ "Torpedoinspektion Abschrift Betrifft: Verwendung der Pi A+B," B. Nr GKDS 523T, 19.3.1940, PG 34636, National Archive Microfilm Publication T1022, Roll 2347

¹³⁰ Ibid.

required. Patience with the MZ was by this point obviously waning, for the orders also contained a stipulation that the new pistols were only to be used with the *Schalterstellung A AZ* setting.¹³¹

March 1940 was the last month of normal operations in the Atlantic before the start of Operation *Weserübung* in April, 1940, when all U-boats were taken off the Atlantic run and redirected to support the ground and naval forces taking part in the invasion of Norway. This support by the *U-Bootwaffe*, code named Operation *Hartmut*, represents the very nadir of the *U-Bootwaffe*'s performance, for it was here that torpedo failures, already high to begin with, assumed truly mind-boggling proportions that robbed the U-boats of tremendous success. Indeed it is this period in particular that spawned the term "Torpedo Crisis." At the same time, it was the events in the aftermath of this spectacular failure – a reorganization of the torpedo arm, the search for responsibility, and a new contact pistol based on torpedoes recovered from a captured British submarine – that in conjunction with the improvements in torpedo design undertaken by Admiral Kummetz the previous winter, delayed until now by the icing over of the Baltic testing stations, set the stage for another period – the remarkable recovery of the *U-Bootwaffe* during the "Happy Times" beginning that summer.

For all these reasons, it is useful to view March 1940 as a transitional phase between these first two periods. During the first 19 days of this month, according to Dönitz' U-boat efficiency chart, a total of twenty-eight boats were deployed at the front for a collective duration of 390 days. During this period, the boats fired a total of fifty-two torpedoes, of which three were pistol failures, three torpedo failures, and a further four failures of unknown origin, for a total of ten failures, or roughly 20 percent. Of the remaining shots, only forty-one torpedoes

¹³¹ "Torpedoinspektion Schnellkürzbrief," B.NR Gkds. 519T, 20.3.1940, PG 34636, National Archives Microfilm Publication T1022, Roll 2347

were considered evaluable. Twenty-eight torpedoes, or 68 percent, had hit their targets, while thirteen, or 32 percent, had missed.¹³²

It must be pointed out, however, that these figures are at odds with the TI's own assessment of the same period. According to their evaluation of all the compiled U-boat *Schussmeldungen* for the month of March, 1940, with the most recent shooting occurring on the 20th, the U-boats fired a total of 141 torpedoes. Of these, a total of sixty-eight, or 48.2 percent, had found their mark. Thirty-six torpedoes, or 25.5 percent, had missed, while thirty-seven torpedoes, or 26.2 percent, were failures. Of these failures, twelve (32.4 percent) were classified as "torpedo failures," which basically refers to those failures originating from a source other than the pistol. Sixteen (43.2 percent) had been premature detonations, while six (16.2 percent) had missed the target and then gone on to detonate. Three (8.1 percent) were due to failures of unknown origins.¹³³

On a larger scale, on the eve of *Weserübung*, from the middle of November 1939 up until March 20, 1939, U-boats fired a total of 376 torpedoes on 365 shots (discount for fan shots) equipped with the new Pi (a+b) pistol. Of these 163 had hit their target, for a hit percentage of 44.6 percent. 107 torpedoes had missed, for a rate of 29.3 percent. Finally a total of ninety-five (26 percent) were considered failures. Of these, twenty-two (23.2 percent) were considered torpedo failures, twenty-nine (30.5 percent) were premature detonations, while fourteen (14.7 percent) had missed the target but had detonated anyway. A total of thirty (31.6 percent) were

¹³² "Befehlshaber der Unterseeboote Operationsabteilung: Wirkungsgrad der im März eingesetzten U-Boote," B.Nr. Gkds. 684 A5, 19.3.1940, PG 34633, National Archives Microfilm Publication T-1022, Roll 2345-2346

¹³³ "Auswertung der bei der TI im Monat März eingegangen Schußmeldungen von U-Booten," B.Nr. Gkds 665/40, 20.3.1940, PG 34633, National Archives Microfilm Publication T-1022, Roll 2345-2346

failures of unknown origin.¹³⁴ The performance of the surface fleet was far more modest. Since the start of the war, all surface ships had fired only nine torpedoes on four shots. Two of these shots had hit, for 50 percent, while two had missed (50 percent). No failures had been recorded.¹³⁵

¹³⁴ "Auswertung der bei der TI seit Mitte November 1939 (Einführung der Pi A+B) bis zum 31.3.1940 eingegangenen Schußmeldungen von U-Booten," B. Nr. Gkds. 665/40, PG 34633, National Archives Microfilm Publication T1022, Roll 2345-2346

¹³⁵ "Auswertung der TI seit Kriegsbeginn bis zum 31.3.40 eingegangenen Schußmeldungen von überwasser T-Trägern," B.Nr. Gkds. 665/40, PG 34633, National Archive Microfilm Publication T-1022, Roll 2345-2346

Chapter 4

The *Torpedokrise* Phase II: Operation *Weserübung* and its effects (April 1940)

Although Norway was technically a neutral country, her geographical position ensured that this status would not last. Located as she was next to Sweden, home of the rich iron ore upon which much of Germany's war economy depended, it was from the start inevitable that Norway would either be occupied by Germans seeking to safeguard the flow of this valuable commodity into the fatherland, or by Allied powers seeking to shut it off as well as to bottle up the German navy inside the North Sea. Indeed, Winston Churchill had advocated this exact course of action since the outbreak of hostilities, and after March 12, when the brave Finns were finally defeated by the Russian juggernaut in the Winter War, Neville Chamberlain and the French Prime Minister, Paul Reynaud, had approved such a plan to occupy Norway.¹³⁶

The Plan of Invasion

Hitler had long suspected that the Allies would attempt an invasion of Norway, a view which was strengthened by intelligence reports speaking of the creation of a restricted area in Scotland northeast of the Caledonian Canal in which troops were being massed and by further reports indicating the massing of British warships in Scapa Flow. Such intelligence clearly presaged plans for an Allied invasion, one which Hitler was determined to prevent by striking first.¹³⁷ Accordingly, on March 4 the German Naval Staff ordered all ships and U-boats to

¹³⁶ Blair, 145

¹³⁷ Dönitz, FdU/BdU KTB, 5.3.1940, PG 30261, National Archives Microfilm Publication T1022 series, Roll 3979, 112

concentrate in German harbors to prepare for immediate action against Norway. The following day Dönitz attended a conference in Berlin to discuss preparations for the invasion. As was to be expected with any amphibious operation, the German Navy, tiny in comparison to those of Great Britain and France, her two principle adversaries, would play a crucial role. It was decided that the operation would be carried out by sudden, simultaneous landings in six key Norwegian ports: Narvik, Trondheim, Bergen, Egersund, Christiansand, and Oslo. The troops were to be transported to the first four places by naval forces, and to the last two by both naval forces and civilian transports.¹³⁸

Once this was accomplished the Allies were expected to respond either against the newly acquired German bases or by trying to set up bases of their own. It was obvious that the Royal Navy would attempt to sever communications by sea between the troops in Norway and Germany. It was the task of Dönitz' *U-Bootwaffe* to cover the warships and assault troops after the landing by keeping these lanes of communication open and by preventing Allied counter-landings. The chief difficulty here was geography. There were simply too many points on the Norwegian coast, with its numerous fjords and approaches to them, at which an enemy landing could be made. Because of this it was deemed both better and necessary to have groups of U-boats stationed in the open sea within reach of the endangered positions, against which they would be free to operate, once the intention of the enemy became known. It was hoped that the disposition of these packs would give them a reasonable prospect of intercepting the enemy before he reached the point in question.¹³⁹

Protection of the areas north of 63 degrees latitude would be handled by large ocean-going boats, while that to the south was the responsibility of the smaller boats. The disposition

¹³⁸ Günter Hessler, *The U-Boat War in the Atlantic 1939-1945* (London: Her Majesty's Stationary Office, 1989), 17

¹³⁹ Dönitz, FdU/BdU KTB, 6.3.1940, PG 30261, National Archive Microfilm Publication T1022 series, Roll 3979, 114

of U-boats was as follows: off Narvik were stationed four type VIIBs in deep echelon: U-46 (Sohler), U-47 (Prien), U-49 (Von Gossler), and U-51 (Knorr). Off Trondheim was a group of two type VIIs; U-30 (Lemp), and U-34 (Rollman). Bergen was protected by a group of five boats – U-52 (Salmann), U-38 (Liebe), U-43 (Ambrosius), and U-44 (Mathes) – two each in deep formation off both the main approaches, with a fifth immediately of the harbor. Stavanger was guarded by two boats, one immediately outside the entrance and the second in the outer approaches. Two attack groups were also formed. A northern group which consisted of six large boats would take up waiting positions in the area northeast of the Shetlands, and a Southern group, consisting of three smaller boats, to be held in readiness east of the Orkneys, along the supposed approach route of the enemy forces in the Shetlands-Norway. An additional group of two boats would be disposed off Pentland Firth to cover the eastern approach to Scapa Flow. A further group of three small boats from the *U-Bootschule* would operate south of Norway to cover the central North Sea and the western approaches to Skagerrak.¹⁴⁰

The operation involved many contingencies. In all of these cases it was paramount that the boats approach unnoticed and remain undetected until the day of the landings. The entrances had to be closed as soon as possible after the passage of the landing crafts, and a high degree of coordination would be necessary to avoid instances of mistaken identity between the U-boats and German surface forces. As the German forces were numerically greatly inferior to their enemies, it was absolutely necessary to concentrate exclusively on the landing and to abandon everything else not implicitly connected with them. As such, Dönitz carefully instructed his captains to avoid splitting up against subsidiary targets, not to attack any merchant ships or convoys in other areas, to maintain the strictest radio silence, except in cases where it was absolutely necessary to report vital information, and not to waste their ammunition, especially their scarce supply of

¹⁴⁰ Entry of March 9, 1940, *Ibid.*, 117-118

torpedoes, for purposes that did not serve to screen the operation. Finally, steps were taken to ensure the greatest secrecy possible. Commanders were not told any information about the operation in the days leading up to it; orders were delivered to them in a sealed envelope with instructions to open them only upon reaching their designated areas.¹⁴¹

The operation would be a radical role reversal for the U-boats. Hitherto they had operated for the most part with a great degree of freedom, conducting individual attacks on lone merchant ships while evading Allied escorts. Now they would be asked to operate in the tight confines of Norway, and instead of merchantmen, their targets were likely to be almost exclusively warships.

Geographically speaking, Norway was a very dangerous area for submarines to operate in. The Arctic nights of April, if they could be called “nights” at all, were exceedingly short – lasting only four or five hours at most. As it was absolutely critical that the boats remain concealed, it was necessary that they remain submerged up to nineteen or twenty hours every day. This badly fouled the quality of air available to the crew to the point that breathing was difficult, which in turn dulled both wits and alertness. The long periods of submersion also badly taxed the boat’s batteries, especially as the short nights barely afforded enough time to recharge them fully. Finally, the fjords in which the boats would be operating were very narrow and sometimes exceedingly shallow. If a boat was located by a destroyer it would not have much room to maneuver, nor would it be able to dive to some extreme depth to avoid a depth-charge attack.¹⁴²

In spite of these dangers, however, and also in spite of the fact that the new improvements to torpedoes and pistols engineered earlier by Kummetz were not yet available as

¹⁴¹ *Ibid.*, 118

¹⁴² Blair, 149

a result of the prolonged icing over of the Baltic Sea, the spirits of the crews – their excitement heightened perhaps by the opportunity for kills – was high going into the fray. With evident excitement, Knight's Cross winner Viktor Schütze wrote in his war diary on April 9 that “the radio report says that not only is the bulk of the entire British fleet in movement, but also it seems the French are as well: for the U-Boats around the Shetlands there are great possibilities.”¹⁴³ All too soon, however, this spirit of initial excitement would turn into one of profound disgust and depression as the first torpedo failures began to be felt.

The Invasion

Prior to this point, except for the daring exploits of the handful of German surface raiders, such as the well known fight of the *Admiral Graf Spee* with British warships off of Montivideo harbor, the surface units of the *Kriegsmarine* had seen precious little fighting. This was all to change at Norway. On April 6 the German destroyers *Georg Thiele*, *Wolfgang Zenker*, *Bernd von Arnim*, *Erich Giese*, *Erich Koellner*, *Diether von Roeder*, *Hans Lüdemann*, *Hermann Künne*, *Wilhelm Heidkamp*, and *Anton Schmitt* departed the German port of Bremerhaven for Narvik. Each destroyer carried a company of roughly 200 soldiers from the 139th *Gebirgsjägerregiment* commanded by General Eduard Dietl. These troops were to have the task of securing the crucial port of Narvik. The flotilla arrived at their destination early in the morning on April 9, 1940. Their progress was briefly impeded however by the two Norwegian coastal defense ships *Eidsvold* and *Norge*. *Eidsvold* was engaged by the German destroyer *Wilhelm Heidkamp*, which fired a spread of four torpedoes at the Norwegian, two of which hit, blowing the old vessel out of the water. Further into the harbor the crew of *Norge* could clearly

¹⁴³ Viktor Schütze, U-25 KTB, 9.4.1940, PG 30022/1-8, National Archive Microfilm Publication T-1022, Roll 3027

hear *Eidsvold's* explosion, but could see little in the surrounding blizzard. Suddenly out of the snow came the destroyer *Bernd von Arnim*. *Norge* immediately opened up on *Bernd von Arnim* with her main battery of 21cm guns, while the destroyer responded with a total of seven torpedoes.¹⁴⁴ As would become typical during operations off Norway, *Bernd von Arnim* was plagued from the start with torpedo malfunctions. The first torpedo ran off course for unknown reasons. The second and third torpedoes, due to a “transmission error resulting from combat noise,” both hit the water at the exact same time, inadvertently striking each other with the result that both ran off course in opposite directions. The fourth and fifth torpedoes were “ground runners” (*Grundgänger*). It was suspected that freezing weather conditions had somehow complicated the depth mechanism, causing both torpedoes to steer downward after a distance of 100 meters. The same was suspected for the sixth torpedo, only instead of steering down, the depth rudders steered the torpedo upwards, so that she became a surface runner before striking the Norwegian amidships. A seventh torpedo finally functioned correctly, also striking the Norwegian which exploded and sank within minutes.¹⁴⁵

Upon learning of the German landing, the Royal Navy dispatched the 2nd Destroyer Flotilla under Commodore Bernard Warburton-Lee with orders to ambush the German force laying at anchor in Narvik. His group consisted of five destroyers, the HMS *Hardy*, *Hotspur*, *Havock*, *Hunter*, and *Hostile*. Warburton-Lee arrived off Narvik on April 10.¹⁴⁶ The approach to the harbor was, as we have seen, guarded by four U-boats, U-25, U-46, U-51, and U-64. At the time of his arrival the boats were caught in a ferocious blizzard. In this awful weather none of the lookouts on the conning towers could see more than a few feet in front of them, and

¹⁴⁴ Jürgen Rohwer, *Chronology of the War at Sea 1939-1945: The Naval History of World War Two* (Annapolis, MD: Naval Institute Press, 2005), 18-19

¹⁴⁵ “Einsatz der Torpedowaffe der Zerstörer vor Narvik,” Anlage zur T Wa B.Nr. Gkds 2526/40, page 1, PG 34634, National Archives Microfilm Publication T1022 series, Roll 2346

¹⁴⁶ Rohwer, 19

consequently the British destroyer squadron was able to slip by unnoticed, or if spotted it was so sudden that the U-boats had no time to react. Warburton-Lee first encountered and was engaged by the German destroyers *Diether von Roeder*, *Wilhelm Heidkamp*, *Anton Schmidt*, *Hermann Künne*, and *Hans Lüdemann*. In the course of this engagement, *Diether von Roeder* fired a total of eight torpedoes, *Hermann Künne* fired another eight torpedoes, and *Hans Lüdemann* fired four. The subsequent German torpedo report says that none of these torpedoes hit due to a “tactically unfavorable position” and the “high speeds of the enemy targets.” Although these factors would undoubtedly complicate matters, it still seems suspect to say that all twenty failed to find their mark due to these two factors alone. The sheer number fired would seem to make it quite probable that, assuming the torpedoes were functioning as they should have, at least one would connect with a target. In any event, in the course of this engagement the German destroyers *Wilhelm Heidkamp* and *Anton Schmidt* were both lost, with the overall commander of the Flotilla, Commodore Bonte, being killed as well. Having made short work of their unprepared adversaries, the British moved further into the harbor, where they encountered a total of twenty-five transport ships laden with iron ore, ten of which were German, which were undoubtedly bound for the Fatherland. Six of these, along with their precious cargoes, were sent to the bottom. From this point on things began to go badly for the British. On their way out of the harbor the force was ambushed by a further five German destroyers, the *Wolfgang Zenker*, *Erich Koellner*, *Erich Giese*, *Georg Thiele*, and *Bernd von Arnim*. *Georg Thiele* got off one three-torpedo fan shot at the British ships, while *Bernd von Arnim*, *Wolfgang Zenker*, and *Erich Giese* all managed to fire one torpedo apiece. Of these all either missed or malfunctioned except for one by the *Georg Thiele*, which hit the English destroyer HMS *Hunter*. The English on their part fired a total of nine torpedoes, which the German destroyers managed to out-maneuver.¹⁴⁷

¹⁴⁷ “Einsatz der Torpedowaffe der Zerstörer vor Narvik,” Anlage zur T Wa B.Nr. Gkds 25260/40, page 2, PG 34634,

During this engagement the British destroyers HMS *Hardy* and *Hunter* were both sunk by gunfire, while the *Hotspur* was heavily damaged.¹⁴⁸

Meanwhile, sitting outside of Narvik, Schütze had not enjoyed his sentry role thus far. In particular, he deplored the lack of information that although necessary, prevented him from knowing anything about the course of the landings, about which he was very concerned. “Is the landing successful?” he wrote in his logbook. “What is the attitude of the local population? Are there enemies in Narvik? How strong is our landing troop? Are we still expecting transports?”¹⁴⁹ For the time being, all of these questions had to remain unanswered. Events the next day did not go well either. In particular, he found the constant fog and poor visibility inside the Fjords greatly hampered his ability to perform his mission of guarding the harbor entrance.

At midnight on the 10th he had seen a steamer in his area. As she sailed without markings, he assumed she was an Allied vessel, and ventured an underwater attack against her, but his torpedo ran wild. Suddenly, at 4:15 in the morning, destroyers had suddenly appeared in his periscope, but the position of his boat relative to that of the destroyer was not suitable for an attack.¹⁵⁰ Moreover, the destroyer was running at high speed and soon slipped away unnoticed into the fog. Schütze was powerless to act. Indeed, given the fog and the already poor visibility afforded by the U-boat’s conning tower, it would have been miraculous if Schütze or any of the other U-boats guarding the entrances had actually succeeded in sealing the entrances.

Soon after the destroyers had slipped by, Schütze’s anxiety was further amplified by the clearly audible sound of “cannon thunder” coming from the direction of Vestfjord. “Is a fight

National Archives Microfilm Publication T1022 series, Roll 2346

¹⁴⁸ Information for the First Battle of Narvik taken from Vincent P. O’Hara, *The German Fleet at War, 1939-1945* (Annapolis, MD: Naval Institute Press, 2004), 32-40

¹⁴⁹ Viktor Schütze, U-25 KTB, 9.4.1940, PG 30022/1-8, National Archives Microfilm Publication T1022, Roll 3027

¹⁵⁰ Entry of April 10, 1940, *ibid.*

going on in Narvik? Where are our destroyers? Is Narvik still in German hands” he wrote in his log. All throughout that day Schütze, and undoubtedly the other three captains, pondered these questions.¹⁵¹

Suddenly at 2050 hours, by which time visibility had considerably improved, Schütze spotted two destroyers making for the exit of the harbor, with further masts visible behind them. This time he had adequate time to make ready an attack. Wanting to eliminate the chance of torpedo failure as much as he possibly could, Schütze determined to fire from his four forward tubes two torpedoes at each of the two destroyers. Each destroyer would get one G7e torpedo set with magnetic detonation and one set with impact detonation. Schütze carefully made note of the course and bearing, and fired submerged, diving immediately after as was normal practice. Down in the control room Schütze waited. One minute and forty-five seconds later he heard a strong detonation, followed by another. Schütze’s hydrophone operator reported that he could hear the turning of the destroyer’s screws, and then following the detonations he heard nothing. A hit! “Until the detonation,” Schütze wrote, “both destroyers could be heard. Then both became silent, so that I can count on having sunk two destroyers.”¹⁵²

Schütze’s celebration was premature, however. In truth neither he nor KptL Knorr in U-51 had achieved anything. The detonations Schütze had heard were, as was increasingly to be expected, the sound of his torpedoes blowing up before their target. For his part, Knorr in U-51 reported observing two premature detonations and two misses. Why Schütze was unable to hear the destroyers’ screws after the explosions is not known.

Thus came to an end what became known as the 1st Battle of Narvik. Although losses were incurred on both sides – for the British two destroyers sunk and one damaged, for the

¹⁵¹ Ibid.

¹⁵² Ibid.

Germans two destroyers sunk, one ammunition supply ship sunk, six cargo ships sunk, and a further four destroyers damaged – the result must be counted as a British victory, in that they inflicted far more damage than they had taken. In terms of torpedo performance, the results had been below dismal. All in all, counting both the previous day's actions against the Norwegian coastal defense ships and the destroyer's and submarine's attacks on the 10th, the Germans had fired a grand total of forty-four torpedoes. Of these forty-four torpedoes fired, a total of five had hit their targets. In other words, during two days work a paltry 11 percent of the torpedoes fired had actually connected with their targets. If one discounts the surface runner, which rather fortuitously hit the *Norge*, the success rate was an even more dismal 9 percent.

The events of April 10 greatly shook Hitler. Fearing a strategic reversal that would cut off and destroy Dietl's forces which currently occupied Narvik, Hitler directed every available ocean going U-boat to converge on Narvik both to repel the expected follow up attacks by the Royal Navy and also to transport urgently needed supplies to Dietl's command. Accordingly, Dönitz directed a further twelve boats to Narvik, including the brand new U-64 and U-65, despite the fact that the crews were very green and were therefore of limited value. One of the boats racing to Dietl's aid was the veteran U-48, which, commanded by KptL Schultze, would go on to become the most successful U-boat of the war. On the 11th she established contact with a sizeable enemy force of three battleships, several heavy cruisers, a light cruiser, and five destroyers. Despite being unable to summon up any help from the other boats in the area, Schultze made a daring series of three separate solo attacks against the powerful force, firing a total of seven torpedoes. Of these seven, Schultze registered four premature detonations, and the other three ran wild.¹⁵³

¹⁵³ Blair, 149

Meanwhile, back at BdU headquarters Dönitz impatiently waited for news from the front. Obviously both he and OKM were aware of the setback at Narvik, but owing to the standing orders to maintain radio silence he was unaware of the performance of his U-boats. From monitoring the messages of the enemy and also the intermittent scheduled reports of his own forces, however, he knew that the enemy kept up a constant patrol in the areas in which the U-boats were positioned. In order to form a clearer picture of what was going on, on the morning of the 11th Dönitz decided to request a situation report from his boats in the area. As the sector was already patrolled by the enemy who at any rate must by now have been aware to the presence of U-boats in the area, the danger posed by wireless communication in this sector was negligible. As we have already seen, the responses Dönitz received from U-51, U-48, U-64 and U-25, which continued to roll in throughout the 11th, were worse than he could have imagined. These reports, in Dönitz words, gave rise to “extreme doubts as to the effectiveness of magnetic fuse in Zone O.” “The question of torpedo failure,” he went on to add, “appears to threaten the success of the entire operation.”¹⁵⁴

The main problem so far in Norway, as stated by Dönitz, lay with the faulty performance of the MZ detonating pistol. Although the MZ had certainly had a very sketchy history up to this point, during Operation *Hartmut* the geographical terrain of Norway now conspired with the host of other difficulties that ordinarily beset the MZ with the result that the MZ simply refused to work at all in Zone O – in latitudes N of 62 degrees N. In the Southerly areas the torpedoes continued to function as before. As already mentioned, this was because the lines of force of the earth’s magnetic field varied in strength according to a vessel’s position on the globe. This field intensified and exerted a stronger influence on the torpedo pistol’s ignition coil the farther north a vessel went. Thus in extreme northern latitudes such as Norway the danger of premature

¹⁵⁴ Dönitz, FdU/BdU KTB, 11.4.1940, PG 30262, National Archives Microfilm Publication T1022 series, Roll 4063, 7

detonation was great.”¹⁵⁵ Aside from this, the magnetic seams of iron ore – particularly dense around the Lofoten Islands which straddled the approaches to Narvik – made the entire operational area one of these “interference areas” where a zone’s otherwise constant magnetic field became abnormally strong and hence made the smooth functioning of the MZ all but impossible.¹⁵⁶

Whatever its causes, the possibility of premature detonations occurring in the narrow confines of the Norwegian Fjords was something that greatly concerned Dönitz. As he wrote in his KTB, “these premature fusions mean . . . not only a significant lack of hits, but also a considerable danger to the boats themselves. This particularly affects the boats defending Westfjord, which, after firing at a destroyer with a premature, are greatly handicapped in the comparatively restricted area during the search for them.”¹⁵⁷

The potentially harmful influence of these ore deposits was not a factor that had gone unnoticed by BdU during the planning phase of operation *Hartmut*. In November 1939 for instance, following some difficulties reported by U-39 operating off Kola and West Fjord, BdU “expressed his doubts [about the influence of the Norwegian coast on torpedo operations] to the Torpedo Institute . . . and requested an enquiry and definite ruling. They were unanimously of the opinion that no magnetic effect existed.”¹⁵⁸ Nevertheless, the commanders proceeding to Norway had been warned to expect possible difficulties with the MZ off the Norwegian coast. On April 8 for instance Schütze wrote in his KTB that he was setting some of his torpedoes to impact detonation based on the advice of the *Segelhandbuch*, which warned that “in these areas

¹⁵⁵ Bekker, 128

¹⁵⁶ Ibid.

¹⁵⁷ Dönitz, FdU/BdU KTB, 11.4.1940, PG 30262, National Archives Microfilm Publication T1022 series, Roll 4063, 8

¹⁵⁸ Ibid.

great magnetic disturbance must be reckoned.”¹⁵⁹ Moreover, the particular climate of the operational area was something that Dönitz always considered when assessing the likely performance of U-boats. Thus, on the 15th of the previous December, while discussing his decision to send U-boats towards Montevideo in an effort to help the *Graf Spee*, Dönitz had written that “torpedo pistols [and] electric torpedo batteries” are likely to be affected “in view of the changes of climate.”¹⁶⁰

In any event, the incoming reports of the 11th led to a series of telephone conversations between Dönitz, the TVA, and Professor Cornelius, which in Dönitz words “[brought] me no support in this doubtful situation.”¹⁶¹ The TVA, who still disagreed with Dönitz on the possible effect of the Norwegian coast on magnetic detonation, suggested that the boats switch over exclusively to contact detonation or, if magnetic detonation was to be continued, to fire torpedoes with eight second intervals between them so that one premature detonation would not also detonate the other torpedoes of the same spread.¹⁶²

With these recommendations in mind, Dönitz debated what ought to be done next to ensure the best possibility of success from the U-boats. In truth, the demands of the situation placed him in quite a dilemma. On the one hand, despite their lack of success so far, the boats nevertheless had to continue in their efforts of assisting German troops ashore by keeping open the lanes of communication against all opponents, including destroyers. To do this the MZ was required, as the depth setting regulations with the AZ ruled out attacks against destroyers. On the other hand, Dönitz saw the intentional endangering of the boats through premature detonation as being in no way justifiable, as the chances of success would also be jeopardized and because

¹⁵⁹ Viktor Schütze, U-25 KTB, 8.4.1940, PG 30022/1-8, National Archive Microfilm Publication T-1022, Roll 3027

¹⁶⁰ Dönitz, FdU/BdU KTB, 15.12.1939, PG 30253, National Archives Microfilm Publication T1022 series, Roll 3979, 69

¹⁶¹ Dönitz, FdU/BdU KTB, 11.4.1940, PG 30262, National Archives Microfilm Publication T1022 series, Roll 4063, 8

¹⁶² Ibid.

the boats lost could not be replaced. Adhering to the TVA's suggestion and ordering all the boats to use *Schalterstellung A* had the advantage of cutting out premature detonations and ensuring the greater safety of the boat, but had the main disadvantage of relinquishing anti-destroyer warfare and along with it, the boat's duties. Persisting in the use of the magnetic pistol allowed the boats to continue attacking destroyers and carried the advantage of achieving a greater effect with a hit, but also made such hits far less likely, and due to the possibility of premature detonations, placed the boats in considerable danger. The result was a compromise. In Zone O and to the north of it, boats were to keep their four forward tubes ready for action with three torpedoes set with switch setting A and one with the MZ setting. Attacks against large vessels were to be done exclusively with switch setting A using a depth setting of two meters. Against destroyers the boats were always to use a double shot, first with switch setting A with three meters depth, then fan shots of magnetic torpedoes in eight second intervals.¹⁶³

While Dönitz hoped that this complicated arrangement would permit the boats to achieve at least one hit with one of the torpedoes, given his views on the deplorable state of his torpedoes, he must have had his doubts whether it would work. "We are," Dönitz fumed in his war log, "technically in the same position as in 1910 with the reservation that the torpedo is less reliable in maintaining depth. The difficulties and obscurities which arise in the use of the magnetic firing device are after Professor Gerlach's research, *at the moment insurmountable* and in no way even nearly clearly outlined. There is no doubt that the premature detonation of torpedoes has caused U-boat losses; it will perhaps never be known how many boats we have lost on this account. If premature detonation also occurs in the southerly areas, a general changeover to contact detonators will be unavoidable . . ."¹⁶⁴

¹⁶³ Ibid., 8-9

¹⁶⁴ Ibid., 9

Back at Narvik, despite Hitler's orders to send all available boats to Dietl's aid, events had suddenly gone from bad to worse. Resentful of their only partially-won victory and deeming a success of some sort necessary for the purposes of rejuvenating flagging morale, the Royal Navy determined to annihilate the remaining German vessels stationed at Narvik. To this end a powerful task force under the command of Vice Admiral William Whitworth and consisting of the battleship *Warspite*, aircraft carrier *Furious*, and nine destroyers arrived at the entrance to Narvik on April 13. They found the eight remaining German destroyers, now commanded by *Fregattenkapitän* Erich Bey, nearly out of ammunition and basically stranded in the harbor entrance due to a lack of fuel.

Oddly enough, the first casualty of the ensuing battle was U-64, which had the misfortune to be caught on the surface by a Swordfish launched from the *Warspite*. She would become the second U-boat of the Second World War to be sunk by aircraft (after U-31), but she would hardly be the last.¹⁶⁵ *Erich Koellner*, which tried to ambush the British force with a torpedo attack, was spotted by aircraft and sunk by a storm of 15 inch shells from *Warspite's* guns. After a brave but futile effort to fight it out with the British force, the remaining German destroyers, with little ammunition remaining, attempted to flee into the numerous fjords of Narvik but were hindered by the lack of fuel. *Hermann Künne* was chased by HMS *Eskimo* into the Herjangsfjord where she was scuttled by her crew. *Eskimo* was in turn ambushed by *Georg Thiele* and *Hans Ludemann* and in the process lost her bow yet miraculously survived. *Diether von Roeder* and *Erich Giese*, crippled by engine problems, bravely attempted to fight it out shot for shot with the English battleship and destroyers but were soon sunk. The remaining German destroyers, critically short of fuel, were scuttled by the crews. As an interesting footnote to the engagement, the roughly 2,600 shipwrecked German sailors who managed to make their way on

¹⁶⁵ Blair, 151

shore were picked up and incorporated into Dietl's force as the "*Gebirgsmarine*" (mountain-Navy) and would play large role in the ensuing land battles to come.¹⁶⁶

The performance of the U-boats standing sentinel outside the harbor was even less impressive than that of the destroyers, who at least had made a brave showing of things and had inflicted some significant damage on some of the British ships. The first boat to spot the incoming British task force was the brand new U-65, commanded by Hans-Geritt von Stockhausen. Although the crew was very green and lacked experience, von Stockhausen unhesitatingly attacked two of the British destroyers with the prescribed settings – two torpedoes per destroyer, one contact and one magnetic with eight seconds spacing between them. None of these hit, and for his pains von Stockhausen was subjected to a punishing depth-charge attack from which he was lucky to escape.¹⁶⁷

Proceeding into West Fjord, the British force then encountered Schütze in U-25, who like von-Stockhausen used the same settings to fire at another two destroyers with the same result. Following this the British were then attacked by U-46 (Sohler) and U-48 (Schultze) as they entered Ofot-Fjord. Sohler managed to slip unseen beneath the British destroyer screen and set up for a spread shot on *Warspite*. Just as Sohler was about to shoot, however, his boat ran into an uncharted bit of rock. U-46's bow road up on this obstruction, which left her perfectly exposed to the British ships. Fortunately, Sohler managed to extricate himself from this situation before the British destroyers, intent as they were on sinking the German surface ships, could notice.¹⁶⁸

U-48 had an equally tough time of things. At first Schultze had surfaced to exchange information for what he initially took for a German destroyer, but which turned out to be British.

¹⁶⁶ Information for the Second Battle of Narvik taken from O'Hara, 41-54 and Rohwer, 19-20

¹⁶⁷ Blair, 150-151

¹⁶⁸ *Ibid.*, 151

Realizing his error, Schultze immediately crash dived and was subjected to a punishing depth-charge attack by HMS *Eskimo* in shallow water, yet somehow managed to survive.¹⁶⁹ Following this close call he managed to get himself into good position for a fan shot on *Warspite*, which he attacked with the prescribed settings – four AZ pistols at two meters depth – yet even with the decreased depth setting none of these hit.¹⁷⁰ A follow up spread of four on two destroyers likewise failed to achieve any results, making Schultze zero for eight. Finally, as the British left Narvik, Schütze in U-25 again managed to get off two separate attacks – one on *Warspite* the other on a destroyer – as the British task force passed through West Fjord. As might be expected by now, none of the torpedoes hit.¹⁷¹

All in all, the torpedo performance at the Second Battle of Narvik was just as abysmal as it had been during the previous engagement. On the part of the destroyers, *Wolfgang Zenker* fired a total of seven torpedoes, while *Hans Lüdemann* had fired four, *Bernd von Arnim* four, *Erich Giese* six, and *Georg Thiele* another four. Of these there were two reported hits, making a grand total of two hits for twenty-five shots fired, a success rate of about 8 percent.¹⁷² As was the case before, none of the U-boats present achieved any success. The surface ships at least had a success rate of 11 percent and 8 percent in the first and second battles respectively, but the U-boats never managed to land a single hit.

This raises the question as to why this was so. Is it simply a coincidence that in both of these cases the U-boats came up empty while the surface ships at least managed some meager results, or was there a reason why the surface ships enjoyed a higher success rate? If there is in fact something other than luck that accounts for the destroyer's slightly better showing it surely

¹⁶⁹ O'Hara, 43

¹⁷⁰ Blair, 152

¹⁷¹ O'Hara, 53

¹⁷² "Einsatz der Torpedowaffe der Zerstörer vor Narvik," Anlage zur T Wa Wa B.Nr. Gkds 2526/40, p. 1, PG 34634, National Archives Microfilm Publication T-162B, Roll 2346

lies in reasons other than the torpedoes themselves, as both surface vessels and U-boats used the exact same kinds of torpedoes. Each torpedo moreover used the same Pi (A+B) pistol, although it should be mentioned that these had different designations depending on whether they were issued to surface ships or to U-boats. Pistols issued to destroyers and similar surface vessels used the designation *Pi-Blau*, while those given to U-boats were called *Pi-Rot*, the distinction referring to the blue or red band that was painted on each pistol. Therefore one possible explanation is that the destroyers, because of their larger size, simply had better visibility than the U-boats, which only had a tiny conning tower as opposed to a tall bridge from which to observe their enemies. Still, it would be interesting to know whether there were any such technical differences between the *Pi-Rot* and *Blau* that might account for the slightly better performance of the destroyers at Narvik.

In any event, this rather appalling performance can best be summed up in the words of Horst Hoffman, a member of the crew who served on Schultze's boat. Describing the engagement after the fact, Hoffman had this to say:

One after the other we fired all our magnetic torpedoes. Not one of them exploded. What the devil was wrong with those bloody torpedoes . . . Not one of those damned tin fish found its mark...the torpedo-gunner's mate inspected the huge, steel cigars, but nothing could he find which might have accounted for their failure. The only redeeming feature had been that Vadi Schultze had remained benignly calm.¹⁷³

Four U-boats had been missing during the Second Battle of Narvik. On April 12, at the same time that Dönitz had sent out his revisions to firing procedure, another set of orders had been sent calling for a re-deployment of boats. Recent reports from the German intelligence service, *B-Dienst*, indicated an Allied landing expected to take place at the next large fjord to the north, Vaagsfjord. Accordingly, the force of boats guarding the entrances to Narvik was weakened by the detachment of four of the nine boats – U-38 (Liebe), U-47 (Prien), U-49 (von

¹⁷³ Newpower, 49

Gossler), and U-65 (von Stockhausen) – whose mission was to sail to Vaagsfjord to intercept, and if possible, prevent this landing.¹⁷⁴ The German intelligence, which for most of the war was generally reliable, proved in this case to be absolutely correct. Whether *B-Dienst* realized it or not, the force they had detected was actually the main British force sent to oust Dietl from Narvik altogether. Although the First Lord, Winston Churchill, had urged a direct landing at Narvik itself, the Army preferred to land at this indirect location and to make their way to Narvik from there.¹⁷⁵

Guided by *B-Dienst*'s accurate sightings, the four boats of the Narvik group managed to get to Vaagsfjord in good time to intercept the British task force. First up were Liebe and von Stockhausen. Liebe attacked the battleship *Valiant* and the cruiser *Southampton*, but all his torpedoes failed. Von Stockhausen's bad luck continued, as his attack on the Polish liner *Batory*, which had been converted into a transport ship, also failed. Steaming into Vaagsfjord the British were met by Prien and von Gossler. Actually the encounter with von Gossler did not come as any surprise to the English, for they had been forewarned of U-49's presence by some Norwegians who had seen the U-boat on the surface earlier in the day recharging her batteries and had reported the sighting to the British. Upon entering Vaagsfjord, therefore, they immediately sent the destroyers *Fearless* and *Brazen* to the reported position of U-49. *Fearless* got a firm sonar contact on U-49 and attacked with depth charges, forcing her to the surface where she was sunk by gunfire. Fortunately, most of the crew survived, having leapt overboard as soon as the vessel hit the surface.¹⁷⁶

So far the first three of the four boats stationed by Vaagsfjord had made no impact at all on the British landings other than to lose one of their own number. If the landings were to be

¹⁷⁴ Dönitz, FdU/BdU KTB, 11.4.1940, PG 30262, National Archives Microfilm Publication T1022 series, Roll 4063, 10

¹⁷⁵ Blair, 152

¹⁷⁶ *Ibid.*, 152-153

hindered in any way, it would have to be done by the “Bull of Scapa,” Günther Prien. Certainly of all the boats he was the best positioned to make an impact. The past two days had been rather hectic for Prien, having been spent dodging various destroyer groups and extricating the boat after running aground in the shallows. For most of the night, short as it was, rather than charging his batteries he had been forced to sit on the bottom to avoid being spotted by any of the small fishing craft and occasional destroyer that seemed to endlessly patrol the area. At around 1730 hours he found himself in the Bydgenfjord, and decided to take the boat in the direction of Storvika where he hoped in the short twilight hours to lay unseen on the surface while he recharged his batteries. Suddenly, while surfacing he heard several distinct rattling noises that caused him to freeze in the water. When everything was again silent he took the boat to periscope depth and proceeded in the direction of the sound. All of a sudden he was confronted with a sight so magnificent as to nearly stop the heart of any U-boat man:

In Bydgen[fjord] lay three large transports. The sounds had seemingly come from the anchors of the ships. Next to the transports lay one French cruiser of the “Suffren” type as well as another cruiser and three additional steam freighter. It is observed that the troop landings are beginning with help of many fishing craft lying nearby for the purpose. All the cutters are proceeding to land in earnest.¹⁷⁷

Entirely by accident Prien had just hit the jackpot! Before the eyes of Germany’s most famous U-boat ace lay the entire British landing force still at anchor, oblivious to his presence and entirely at his mercy. If his torpedoes would just work this one time, he could obliterate the entire Allied landing, thus decisively tipping the struggle for Narvik in Dietl’s favor. Prien leapt into action. He carefully aimed and fired a spread of four torpedoes, one torpedo for each transport and one for the cruiser. However, since the crewman in charge of fire control had forgotten to insert a crucial “side switch” (*Seiteschalter*), the torpedoes did not run on their

¹⁷⁷ Günther Prien, U-47 KTB, 15.4.1940, PG 30044/1-11, National Archives Microfilm Publication T 1022 series, Roll 2970

envisioned course, but rather all closed in the direction of the middle transport. Nevertheless there was no result. As there was no reaction from the landing force, who had apparently not noticed the attack, Prien simply reloaded his four front tubes and lined himself up for another attack. This time both himself and the 1 W.O., Lieutenant Endrass, personally examined four more torpedoes and rechecked all the fire control data. Finding everything to be in order, Prien fired another salvo of four torpedoes, three of which used Switch Setting A. Of this salvo, the torpedo from tube four immediately buckled upon hitting the water and ran off at a ten degree angle where it exploded against some nearby cliffs. The other three failed to detonate.¹⁷⁸

Certain that the explosion of the fourth torpedo against the rocks would have alerted the British to his presence, Prien immediately turned the boat around and tried to escape. In this haste, however, the boat once again ran aground on some unseen rocks. Terrified that the boat would be caught in this terribly exposed and vulnerable position, Prien ordered both engines set to full speed astern while the crew ran from one end of the submarine to the other in an effort to shake the boat loose. While this was going on, Endrass frantically destroyed all the ship's papers and set scuttling charges throughout the boat. Water was then drained from the torpedo tubes and the pressure tanks so as to lighten the boat, but to no avail. Prien then tried a different engine setting, ordering the starboard engine stopped, put the rudder to port, and the other engine and half speed forward. Then, as if this was not drama enough, an armed trawler suddenly arrived on the scene directly in front of U-47's path – just at the same time that the boat finally rocked itself free of the fjord bed. With only a thousand yards to spare, Prien was able to dive under and clear the trawler which belatedly threw a couple of depth-charges at U-47.¹⁷⁹

¹⁷⁸ Ibid.

¹⁷⁹ Entry of April 15-16, 1940, *ibid.*

This event more than any other illustrates the great opportunities of which the Germans were repeatedly robbed as a result of their faulty torpedoes. In just the first week of operations the Germans had already suffered three major setbacks, all of which were almost exclusively the result of terrible torpedo performance. At the First Battle of Narvik for instance, a superior force of German destroyers was badly mauled by a smaller English contingent. Although the German destroyers were admittedly caught unawares, the result would have been much more in their favor had more than just 11 percent of their torpedoes hit. At the Second Battle of Narvik while the German destroyers, hampered as they were by lack of fuel and ammunition, would in all likelihood still have been wiped out by the massive British force led by *Warspite*, as the course of the battle showed they still would have been able to make a better showing of things and perhaps have sunk at least one British ship had their torpedoes worked. Moreover, perhaps the entire disaster could have been avoided if any of the numerous attacks made by the German U-boats posted at the entrance of the harbor had struck home. We have seen that the *Warspite* had come under repeated attack. Would the British force have continued into the harbor if their main weapon had been destroyed? Finally, Germany's best U-boat commander had a chance to destroy the entire British landing force – and thereby save Dietl many hard weeks of fighting – yet could not achieve a single hit despite perfect shooting conditions! It was simply unfathomable!

After getting a safe distance away Prien immediately radioed his experiences to Dönitz. He also had the unfortunate seaman who had mishandled the fire control settings on the first shot arrested for a period of ten days.¹⁸⁰ Prien's report gave rise to grave doubts concerning the usefulness of the new orders of the 11th. "I am now beginning to suspect," Dönitz wrote in his log on April 16, "that even the use of impact firing is not preventing torpedo failures. Either the

¹⁸⁰ Entry of April 18, 1940, *ibid.*

G7e is keeping a much greater depth than hitherto known or the pistol does not arm. A second report from U-47 confirms this idea: in a second attack on the transports another four torpedoes failed to fire. This means a total of 8 unsuccessful shots by our best U-boat commander.”¹⁸¹

Dönitz’s belief in these two matters, that the torpedo ran considerably deeper than suspected and that the pistol either failed to arm or fire, was strengthened by two considerations: first, since the beginning of the war the information Dönitz had received on depth-keeping from the responsible authorities had varied so much over time that he now had the impression that nobody knew with any certainty exactly how deep the torpedoes ran. Second, also since the beginning of the war, Dönitz had received reports from his commanders of torpedoes hitting their targets but failing to detonate.¹⁸² In light of this he immediately requested assistance from Raeder, presenting him with a summary of all the failures thus far. In addition he requested the director of the Torpedo Inspectorate to come to Wilhelmshaven the next day, April 17, for a discussion on these failures. Finally, as it could only be assumed that Prien’s attack would be followed by a dramatic rise of enemy anti-submarine activity, it became necessary in Dönitz words to “get the boats out of this witch’s cauldron and dispose them at the entrance to the Andean Fjords.”¹⁸³ Dönitz decided to pull boats out of the Namses and Romsdale fjords as well as their presence seemed to accomplish little. However, out of this “witch’s cauldron” of failures emerged one faint shred of hope. That same day Dönitz had received a report from U-13 claiming that she had sunk an enemy destroyer north of the Shetlands, which suggested that it might in fact only be Zone O in which the MZ did not work.¹⁸⁴

¹⁸¹ Dönitz, FdU/BdU KTB, 16.4.1940, PG 30263, National Archives Microfilm Publication T1022 series, Roll 3979, 33

¹⁸² Entry of April 17, 1940, *ibid.*, 34

¹⁸³ *Ibid.*

¹⁸⁴ Entry of April 16, 1940, *ibid.*, 33

The following day the requested meeting took place in Wilhelmshaven between Dönitz and the director of the Torpedo Inspectorate, along with some of his assistants. Kummetz for his part was lucky to even be at the meeting. At the beginning of *Weserübung* Kummetz had assumed command of Warship Group 5 and had sailed towards Oslo with the assignment of capturing the Norwegian capital. Unfortunately for him, his flagship, the heavy cruiser *Blücher*, had first been crippled by gunfire from the Norwegian shore batteries and was then sunk with two torpedoes, which apparently did not suffer from the same problems as the German type! The Torpedo Inspector had then been forced to swim around in the freezing icy water for half an hour before finally being rescued.¹⁸⁵ Now poor Kummetz, who from his experiences certainly possessed a personal insight into the problems of Germany's torpedoes relative to that of its enemies, could only stand and listen as a furious Dönitz rehashed all the torpedo difficulties thus far before demanding an explanation.

Kummetz' answers both astounded and infuriated Dönitz. Chiefly it concerned a crucial oversight to certain modifications of the magnetic pistol, which might be the cause of some of the failures by torpedoes to detonate. As mentioned before, each MZ had a small propeller mounted on its nose. Through its turning motion, this propeller served the function of unlocking the firing pin and thereby arming the warhead. Thus, only after a certain number of turns which correlated to a torpedo's "safety run" would the torpedo be armed and ready to detonate. This prevented an armed torpedo from causing any damage to the firing vessel. Normally these pistols were equipped with a five-bladed propeller; however a four-bladed variant had also been issued. Through some oversight these four-bladed propellers had been issued to the fleet without first undergoing any kind of test period. Kummetz reckoned that because of this roughly 10 percent of the new pistols might fail to arm.

¹⁸⁵ Bekker, 131-132

Apart from this, Kummetz made another four assertions. First, he did not consider it possible that the pistol could fail to arm when Switch Setting A (impact) was used. Second, the TI finally conceded that the hitherto undiscovered layers of iron ore on the sea beds of the fjords might in fact negatively influence the MZ and so lead to a premature detonation. Kummetz hurried to assure Dönitz, however, that such interference need only be expected close ashore. Third, Kummetz strongly doubted the reliability of the torpedoes' depth-keeping and therefore strongly urged a return to magnetic firing only. Finally, Kummetz was able to report that *Netzschiessen* (net shots) experiments conducted with torpedoes using the new depth gear had been quite satisfactory, yielding a variation of only .5 meters. In addition to these points, it was also agreed that the firing pin of the Pi1 was liable to release prematurely.¹⁸⁶ The third point must have been particularly frustrating to Dönitz. Just a week before, during the discussion of premature detonations taking place on the 11th, the Torpedo Inspectorate had urged Dönitz to abandon the MZ and go over exclusively to impact detonation. Now, they had reversed their decision, but were unable to provide any assurances that doing so would not result in a re-emergence of premature detonations which would endanger the safety of the boat and crew.

In light of this, Dönitz had little choice but to issue yet another set of operating instructions to the boats, instructions so complicated that Dönitz himself wrote that he “would never give them to operational boats except in present circumstances.” These instructions, as summarized by Dönitz were:

1. The G7a probably runs more than 2 meters below depth set.
2. Boats in Zone O are therefore no longer to use switch setting A, but to fire with “MZ” except inside narrow fjords. Danger of premature detonation is greater in these.
3. No fans with time switches are to be fired with MZ, but multiple shots according to fire control memorandum or improved fans with 8 second intervals.
4. With “MZ,” set depth to equal draft, 4 meters against destroyers, 3 or 4 meters against submarines.

¹⁸⁶ Stern, 82

5. With “AZ” set 4 meters, 3 meters in good weather.¹⁸⁷

With the new orders came a new deployment of the boats, which by the 18th were as follows: After Prien’s inexplicable misses against the transports all boats had been withdrawn completely from West, Ofot, and Vaags Fjords. Of the four Narvik boats, U-46 (Sohler), U-51 (Knorr), and U-48 (Schultze) were all out of torpedoes and were ordered home to Germany. U-25 (Schütze) still had some torpedoes remaining and was ordered to patrol well offshore of the harbor. U-38 (Liebe), U-49 (von Gossler), and U-65 (von Stockhausen) were to remain in the Lofoten area off the entrance to Vaagsfjord, although unknown to Dönitz U-49 had been lost so that the actual number of U-boats lost in the Narvik operation was two. U-30, U-34, and U-50 were to remain outside of Trondheim. Also recalled from Norway was Prien, who after his two harrowing escapes had incurred significant engine damage and so had to return to Germany for repairs, as well as U-37 and U-52. Meanwhile, U-26, 32, 43, 101, 122, and UA were currently in Germany but ordered to Norway, where they were to patrol up and down the coast. U-29 was also en route to Norway. The new deployments were far from what Dönitz had initially intended at the start of the operation, but as he wrote in his war log, “the problem of where to operate the boats depends not only on the usual conditions, but in every case the question: ‘will the torpedo work?’ has to be considered.”¹⁸⁸

On the technical side of things, the next day, the 19th, Dönitz received a call from Kummetz notifying him of two new developments. Regarding the problem of the four-bladed warhead propeller, a follow up investigation revealed that U-38, U-43, U-50, U-52, U-57, U-61, and U-62 had all been issued with this variant prior to their departure from Germany. Thus in addition to all the other problems these boats would have to reckon with at least 10 percent of their

¹⁸⁷ Dönitz, FdU/BdU KTB, 17.4.1940, PG 30263, National Archives Microfilm Publication T1022 series, Roll 3979, 35

¹⁸⁸ Entry of April 18-19, 1940, *ibid.*, 35-36

torpedoes failing to arm. Additionally, Dönitz was told that the TEK had recently conducted a series of tests with G7e torpedoes equipped with the unaltered *Tiefenapparat* that showed the torpedo ran up to 2.7 meters deeper than set. When the G7e had been set to run at two meters, it had in fact kept an actual depth of 3.5 – 4.7 meters. This would explain why none of Prien's torpedoes had hit the transports; they had simply all passed harmlessly beneath them. With this new information, any remaining reasons for keeping the boats in any of the Norwegian Fjords disappeared, as it would not be possible for the boats to use Switch Setting A as the shallowest possible depth setting in good weather was three meters. Given the current state of the depth problem, this meant that no targets with a draught of less than five or six meters, such as destroyers or transports, could be torpedoed. As magnetic firing was out of the question due to the magnetic interference from the fjords, the Germans simply did not possess a weapon capable of operating within any of the Norwegian Fjords in Zone O. Given this, the only option left to Dönitz was a complete withdrawal of all boats from all fjords in zone O.¹⁸⁹ This decision was supported by a report received that same day from U-37 which the previous day had experienced two premature detonations in the area between the Shetlands and Iceland, but then had scored success using Switch Setting A.¹⁹⁰ While this report suggested that it was not only in the fjords where magnetic interference must be expected, it also clearly showed that success was still possible in areas outside of Zone O.

Given this it seemed only a matter of time until a complete withdrawal of all U-boats from Zone O was ordered. This happened sooner (less than a day later) than expected, and the reason was once again provided by Günther Prien. On his way home in U-47, at 1530 hours on April 19, Prien happened across that old workhorse of the Royal Navy, the HMS *Warspite*, who

¹⁸⁹ Entry of April 19, 1940, *ibid.*, 37

¹⁹⁰ *Ibid.*

already had been on the receiving end of three separate U-boat attacks and had emerged unscathed each time. Thinking that since he had left the narrow confines of the fjords behind him – along with their negative magnetic interference – and was now in the open sea, Prien decided to attack her with two torpedoes using the MZ setting. In hindsight it was not a good idea. Of the first torpedo nothing more was seen or heard – Prien wrote it off as a non-detonator. The second torpedo bypassed *Warspite* and exploded at the end of its run 7 minutes and 18 seconds after being fired. Predictably this detonation alerted the two escorting destroyers to Prien's presence and for the next several hours U-47 was subjected to a punishing depth-charge attack. Like the previous episodes, the firing data was correct and beyond question. Prien had personally double checked the fire control data before firing, and according to his calculations, which cover a full page in U-47's war diary, a hit should have been ensured. After reviewing the evidence along with his first officer, Prien arrived at the conclusion that the G7e was keeping a much greater depth than thought and that the magnetic pistol had failed to arm. On the latter point Prien speculated that "as a result of the permanent magnetism of the boat the pistol is in the course of time so influenced that it becomes desensitized. This assumption entails that at the beginning of a patrol the pistol still works, but after the course of time this is no longer the case." A second possibility offered by Prien was that the English were by now degaussing their ships.¹⁹¹

A week later Prien guided U-47 into the safe confines of Kiel. The patrol, his fifth of the war, was over. While this was U-47's first entirely unsuccessful patrol – she sank no ships – and as such was at least on the surface a complete failure, potentially it had in terms of presented opportunity certainly been her richest, and so for Prien, also the most frustrating. As a whole this patrol is best summed up by Dönitz' position report, which is attached to U-47's KTB at the conclusion of her patrol:

¹⁹¹ Günther Prien, U-47 KTB, 19.4.1940, PG 30044/1-11, National Archives Microfilm Publication T1022, Roll 2970

A good attempt, that through torpedo failures was robbed of much success. The sinking of just one of the transports in Vaagsfjord would have had decisively influenced the development of the situation at Narvik.

The fruitless attack on “Warspite” with an end detonator shows the consequences [being depth-charged by escorting vessels] that a detonation at the end of the run can have for the attacking vessel. How many boats have been lost through the consequences of torpedo failures we cannot know, but the calculated loss of boats through torpedo failures is certainly assumed and evident.

From the War Diaries the continuous stress of the U-boat crews is obvious, as a result of the appearance of airplanes and, particularly in the North Sea, the occurrence of torpedo failures.¹⁹²

Upon receiving Prien’s report Dönitz was apoplectic. Including Prien’s two failures against the *Warspite*, this made for a total of 22 unsuccessful shots in the past few days alone. Of these, Dönitz wrote, nine had been premature detonations, which in turn had caused other torpedoes to detonate as well. Before the next day was out, Dönitz would have reports of another twelve unsuccessful shots sitting on his desk. “It is monstrous,” he wrote in his war diary, “that B.d.U should have to be burdened with lengthy discussions and investigations of the causes of torpedo failures and their remedy. This is the business of the technical inspectorates and departments. But as long as these authorities are slow to do what is necessary, I am forced to take action.”¹⁹³

Take action he did. For Dönitz, Prien’s latest failure was the last straw in what was in fact a long series of failures dating back to the beginning of the invasion of Norway. On the morning of the 19th, he had decided to withdraw all the boats from the fjords in Zone O as no success could be expected there. Now that he had received word that Prien had experienced premature detonations *outside* of the fjords as well, it was clear that success could not be expected anywhere in Zone O at all. The rationale behind sending the U-boats to Norway in the first place had been to provide cover for the landing forces and to shield them from an

¹⁹² Position of B.d.U, in Günther Prien, U-47 KTB, 19.4.1940, PG 30044/1-11, National Archive Microfilm Publication T1022, Roll 2970

¹⁹³ Dönitz, FdU/BdU KTB, 19.4.1940, PG 30263, National Archives Microfilm Publication T1022 series, Roll 3979, 39

amphibious Allied counter-attack. While the first objective had been accomplished with the landing of German troops at Narvik and other locations, it was clear that “because the Navy has no torpedo which can be used in the area north of latitude 62.5,” the U-boats were incapable of fulfilling the requirements of the second objective.¹⁹⁴ Accordingly, as allowing the boats to remain would only put them at unnecessary risk, he decided to withdraw all boats from Zone O completely and to reposition them west and east of the Orkneys and Shetlands, in the hope of intercepting traffic from England to Norway and so provide some aid to the thousands of German soldiers occupying Norway.

In addition, the situation occasioned yet another set of operating orders, which in the main concerned adjustments to the shallowest permissible depth setting for the torpedoes. Currently this was set at three meters in good weather, which according to Dönitz was the “shallowest depth setting which leaves any certainty that the torpedo will not break surface.”¹⁹⁵ After the aforementioned tests by the TEK, the TI had urged Dönitz to amend this setting to two meters, on the grounds that none of the thirty shots fired by the TEK at this depth setting had broken the surface. Initially Dönitz was skeptical of the TEK’s results on the grounds that “these shots were fired from an underwater depth of four meters and it is questionable whether the torpedo will not break the surface if it is fired from a tube at ten meters depth (depth of discharge tube when boat is submerged) with a depth setting of two meters, and what happens if the boat is down by the stern, which is not always unavoidable when firing.” Accordingly Dönitz arranged a small test firing of his own, ordering U-30 to fire two of her torpedoes from periscope depth with a depth setting of two meters, one with the boat on even keel and the other while three degrees down by the stern. Neither of these torpedoes broke the surface, and on April 21 the

¹⁹⁴ *Ibid.*, 37

¹⁹⁵ *Ibid.*

boats were given their latest confusing set of operating orders: for MZ shots depth was to equal the ship's draught plus one meter. Against destroyers, submarines, and steamers under 4,000 tons this was to be three meters in bad weather and two meters in good. For AZ torpedoes this was kept at three meters against all targets, and two meters in good weather.¹⁹⁶

Finally, Prien's misses against *Warspite* had sparked debate between Dönitz, Professor Cornelius, and Professor Gerlach as to the possibility that the British were degaussing their ships. According to Dönitz, unless Prien's first failure was a simple miss – which he considered highly unlikely given the range and coordinates – then it must have been due to a degaussing effect. Cornelius and Gerlach by contrast considered this highly unlikely in that it would be “extraordinarily difficult to fit degaussing gear in battleships.” As it had been known for some time that the British had been degaussing their merchant ships, Dönitz was unwilling to dismiss his suspicions given his belief that if it was possible, large capital ships such as battleships would be the first vessels to be degaussed because of their great worth. In any event, his conviction generated another amendment on April 21 to the existing depth orders. Against large capital ships depth was now to be set permanently at five meters with AZ contact, as this would ensure a hit even with the torpedo running three meters deeper than set.¹⁹⁷

Assessments

When Dönitz gave the order to withdraw all U-boats from Zone O, the role of the *U-Bootwaffe* in operation *Weserübung* for all practical intents and purposes came to an end, although to be sure limited action still persisted around the Orkneys and Shetlands, and U-boats

¹⁹⁶ *Ibid.*, 38

¹⁹⁷ *Ibid.*

continued to carry out missions to supply German troops at various locations. Although the overall operation was ultimately successful, the German Navy as a whole had incurred grievous losses in the process. Aside from the painful loss of the ten fleet destroyers in Narvik, the *Kriegsmarine* had also lost the heavy cruiser *Blücher*, the light cruisers *Königsberg* and *Karlsruhe*, numerous transports and auxiliary craft, while the battleships *Gneisenau* and *Scharnhorst*, the pocket battleship *Lützow*, the heavy cruiser *Hipper*, the light cruisers *Emden*, and the auxiliary vessel *Bremse* had incurred varying degrees of damage.¹⁹⁸ To the tally must also be added the loss of two ocean going U-boats.

In terms of its outcome, Operation *Hartmut* probably stands as the biggest failure in the history of German U-boat warfare, a fact that has led many historians to label the entire operation a big mistake. Clay Blair for instance writes that “the role change from merchant ship killer to warship killer had not worked . . . the decision to halt the war on commerce in order to commit the U-boat arm to support the conquest of Norway was thus a mistake.”¹⁹⁹ While it is true that for all their efforts the combined success of the thirteen ocean-going boats committed to the Norwegian operation was one measly 5,200 ton freighter, the *Cedarbank*, balanced against the loss of two of their own number, a closer examination suggests the exact opposite conclusion, namely that the decision to commit the U-boats to Norway and the Navy’s handling of things once the decision had been made was absolutely correct, and tactically brilliant.

It was the job of Dönitz and U-boat command to put the boats in position to achieve success. In this they succeeded, in that the boats were repeatedly in favorable positions to carry out attacks. For example, over the course of operation *Hartmut* the U-boats had made a total of thirty-eight separate attacks against targets of all types. Four of these were made on battleships,

¹⁹⁸ Blair, 148

¹⁹⁹ *Ibid.*, 157

fourteen against cruisers, ten against destroyers, and a further ten on transports.²⁰⁰ Despite the obvious disadvantages posed by the tightly enclosed spaces of the fjords and the fact that they were facing an enemy who was well aware of their presence, in most cases the U-boats had got the better of their opponents by getting off the first shot. By his own reckoning, which may or may not have been somewhat overly optimistic, Dönitz believed that at least one battleship, seven cruisers, seven destroyers, and five transports would certainly have been sunk were it not for the malfunction of the torpedoes.²⁰¹ In at least one case, during Prien's attack on the Allied transports at Vaagsfjord, the U-boats had been in position to achieve decisive success that could have drastically changed the entire course of the campaign. In other words, far from making a "mistake," BdU had correctly placed the boats exactly where they needed to be to achieve decisive success. Had the Germans possessed even a somewhat reliable torpedo, it is difficult to escape the conclusion that this small number of U-boats would have inflicted an appalling slaughter on their foes.

But simply knowing that their superiors had made the right decisions or that they themselves had performed their duty brilliantly in the face of great adversity did little to alleviate the spirits of the men of the *U-Bootwaffe*. Not surprisingly, the most immediate consequence of their undeserved yet stupendous failure was a severe plummeting of morale of both the commanders and their crews. This was particularly evident in the early morning hours of April 20, when having just escaped from a nasty depth charging by *Warspite's* two escorting destroyers, Prien came across a large Allied convoy of ten transports and several destroyers. Although he still had four torpedoes remaining, he had so little faith in their reliability that he made no effort to attack. The decision, which was probably correct and was recognized by

²⁰⁰ *Ibid.*, 159

²⁰¹ Newpower, 51

Dönitz as such, was understandable. For weeks now the crew of U-47, like the crews of every other boat, had given an almost superhuman effort in the worst of conditions to get their boat in correct firing position, only to see all their efforts time and again thwarted by factors completely outside their control. Horst Hoffman, a crewman in U-48, gives a vivid description of the trying conditions that would have been endured by almost anyone on board a U-boat stationed amidst the Norwegian fjords:

Every day and every hour of every day we were attacking destroyers or finding ourselves trapped in the destroyers clutches. Day in, day out, night after night . . . we scurried up and down and round and round the fjord, submerged. And the nights were short, far too short to allow us to charge our batteries and to maintain the boat ready for action. Sleep was out of the question – we hardly found time to get something to eat . . . We used up the air in our oxygen flasks to the very last drop . . . One after another we fired all our magnetic torpedoes. Not one of them exploded . . . Try as we would all our efforts remained completely fruitless . . .²⁰²

Prien shared Hoffman's frustration. When Dönitz wished him better luck on his next patrol, Prien replied by saying "Yes, when we receive the right torpedoes and no longer must fight with wooden swords!"²⁰³ Clearly Dönitz felt the same way, because while he could well have had Prien court-marshaled for failing to engage the enemy when he had the opportunity, nothing more was made of the incident.

The widespread doubts about the torpedoes' usefulness affected commanders in various ways. We have already seen how some commanders, such as Zahn in U-56, became so depressed by the repeated failures that they became emotionally wrecked and had to be removed from front-line duty. Others, such as von Gossler in U-49, became so unnerved by the escorts' counter attack that normally followed a premature detonation that the next time they experienced such failures they tended to give up more easily, blowing their tanks and abandoning ship. The best commanders, such as Prien, Schultze, Kretschmer, Schuhart and Schepke, found better ways

²⁰² Blair, 152

²⁰³ Kurowski, 366

to express their frustration. Sarcasm and irony was one such outlet. On April 12, while receiving a seemingly endless stream of radio transmissions telling of torpedo failure after torpedo failure, Prien jotted down in his war diary “Boys, boys, when someone reads these radio transmissions, he is sure to think of that poster illustration with the caption ‘Germany relies upon her torpedoes!’”²⁰⁴ Whatever the method, the important thing was that this frustration be channeled outwards and away from oneself. Doing so seemed to enable the commander both to better keep his composure and maintain his self-confidence. At the top, Dönitz chose to cope with the crisis by venting his anger and frustration on the unfortunate technical staffs of the various torpedo departments. On May 15 he wrote in his war log that “After 20 years’ peacetime work one might have expected a torpedo better than the one used in the last war . . . *I do not believe that ever in the history of war men have been sent against the enemy with such a useless weapon!*”²⁰⁵

Regrouping of the U-Bootwaffe

Sometimes a spectacular failure is needed to pave the way for spectacular success. This is true because it is in the ensuing atmosphere of crisis and emergency that those in charge are more likely to approve the kind of sweeping changes and reform – which under normal circumstances might well be seen as being too radical – necessary to correct an existing problem. Military history in particular is replete with such examples, whether it is the shift in tactics following the Roman defeat at Cannae to the modernization of the American battle fleet

²⁰⁴ Günther Prien, U-47 KTB, 12.4.1940, PG 30044/1-11, National Archives Microfilm Publication T1022 series, Roll 2970

²⁰⁵ Dönitz, FdU/BdU KTB, 15.5.1940, PG 30264, National Archives Microfilm Publication T1022 series, Roll 3979, 68 [emphasis added]

following Pearl Harbor. *Weserübung* may differ somewhat from other examples in that in our case, Operation *Hartmut* did not alert the Germans to anything they did not already know, nor did it expose any inherent weakness in their strategy or tactics from which they could learn and correct. The problems that beset German torpedoes were legion, and as such the fallout from *Hartmut*, consisting in the main of organizational and personnel changes, the prosecution of those responsible, as well as an increased focus on testing, should be viewed as the most important phase of a process begun some time ago – with the appointments of Admiral Kummetz and professor Cornelius – that ultimately resulted in the removal of the most serious of the torpedoes’ defects.

The month following the conclusion of *Hartmut*, which is roughly the length of time it took the Germans to fix the worst of the problems, was marked by a whirlwind of activity at the home front. In this they were greatly helped by the complete lack of activity at the actual front. Both the *U-Bootwaffe* and the surface fleet had been badly mauled in Norway, and so were in no position to take part in the Battle for France the following month. Freed of the onus of directing front operations, BdU could direct its full attention to the torpedo problem. Dönitz used the statistics he had accumulated to drum up political pressure against the technical bureaucrats, and scored an important victory by gaining the full cooperation of Raeder and OKM. Getting Raeder on board was of greater significance than may at first be thought, for while it would seem to be a matter of fact that both him and Dönitz would be of the same opinion in this matter, the two were actually quite far apart in assessing the extent to which torpedo failures had negatively impacted operations. This disagreement is clearly evident in Raeder’s later order that certain sections of the resultant “Enquiry into Torpedo Failures,” that seemingly took the side of the technical

personnel by attributing the majority of the reported failures to misses by the individual captain, be incorporated into the text of BdU's war diary.²⁰⁶

Nevertheless, despite whatever reservations Raeder may or may not have had as to the accuracy of Dönitz' beliefs, on April 20 he appointed a special committee of investigation composed of officers of the U-boat command and representatives of the Torpedo Inspectorate, under the chairmanship of Kummetz, to investigate the causes of the failure in Norway.²⁰⁷ In the meantime, while Dönitz awaited the committee's findings, Dr. Cornelius and his AGC had been hard at work carrying out intensive tests of the impact pistol. The results, which were presented on May 1, were "worse than could ever have been suspected." Not only was it proved that the AZ pistol was susceptible to a high percentage of failures as a result of the premature release of the firing pin, a fact which Cornelius attributed to its poor and overly complex design, but apparently the pistol had been cleared in peacetime as ready for front-line use after passing a "proving trial" which consisted of only two partially successful shots! "A method of working such as this," Dönitz wrote, "can only be regarded as criminal."²⁰⁸

²⁰⁶ Under the entry for 11 April the following is included: "The point of view expressed by BdU in his reports and War Diary, that shortages of torpedoes and warhead pistols were especially prevalent during the Norwegian operations and had a *decisive* effect on the outcome makes it necessary to point out that one cannot speak of particularly noticeable increase of failures during the Norwegian operation in the comparison with previous U-Boat results. The mishaps of this period can be attributed to a far greater extent to explained misses – 41.8%. They were considerably influenced by the unique, tricky conditions of U-boat warfare experienced in this operation (high firing range, small fast-moving targets, heavy protection, short light nights, un-heated torpedoes and unusual light conditions)."

Under the entry of 14 April the following is included: "BdU's view, expressed in his reports and in his War Log, that defects in torpedoes and their pistols were particularly apparent during the Norway operation and had a decisive effect on the results, must be amended, insofar as there cannot be said to have been a particularly noticeable increase in torpedo failures during the Norway operation as compared with the results of U-boat warfare before this time. Lack of success during this period is rather mainly to be attributed to explained misses, which amounted to 41.8% They were largely due to the unusually difficult conditions for U-boat operations during this undertaking (longer firing ranges, small fast targets, strong escort, short light nights, unheated torpedoes, unaccustomed lighting conditions)."

²⁰⁷ Rössler, *Die Torpedos der deutschen U-Boote*, 87 Hessler, 26

²⁰⁸ Dönitz, FdU/BdU KTB, 15.5.1940, PG 30264, National Archives Microfilm Publication T1022 series, Roll 3979, 68

Happier news came ten days later, when on May 11 Cornelius told Dönitz that the depth problem had been fixed, and that the MZ had been significantly improved. In reality the depth problem had not been fixed, nor would it be for some time yet, until February 1942 when a random torpedo examination performed at sea by the crew of U-94 revealed that the balance chamber in which the hydrostatic valve responsible for depth control was located was prone to leak.²⁰⁹ This problem will be dealt with in more detail later as it appears in our story. All the same, while the depth problem was still not “fixed” per se, it had nevertheless been improved to the point where it performed considerably better than in the past, which must be regarded as an accomplishment. These improvements took the form of a new depth device, designated the TA-1 (*Tiefenapparat 1*), which was issued to the fleet at the end of May 1940 and was delivered in June.

The *Kriegsmarine* also received some unintended help from the British. On May 4, 1940, the British submarine *Seal* wandered into an uncharted German minefield while operating in the Kattegat, where she hit and was disabled by a mine. The blast greatly damaged her stern and began to flood the hull with water. After several unsuccessful attempts, the *Seal's* commander, Rupert Lonsdale, finally succeeded in getting *Seal* off the seabed and onto the surface where it was spotted by German aircraft. Lonsdale's position was quite hopeless. His light machine gun, with which he tried to fight off the German aircraft, had jammed. The boat's engines were not working, she was without power, and was unable even to dive. Nor would she scuttle, despite repeated attempts by the crew. With no other alternative, Lonsdale destroyed the

²⁰⁹ Blair, 160

valuable Asdic equipment as well as the boat's secret papers, and took the rather embarrassing step of surrendering to the German aircraft.²¹⁰

The big advantage of scuttling a stricken vessel is that it prevents valuable equipment from falling into the hands of the enemy. Machines can of course be smashed, and papers can be burnt or shredded, but on a ship there are always certain objects that cannot simply be done away with. Unfortunately for Lonsdale, one such object is a torpedo.²¹¹ *Seal* was towed back to Germany with all haste, where she was turned over for inspection to the eagerly awaiting technical staff of the U-Boat Acceptance Command (U.A.K.). Upon inspection of the vessel, *Seal* was found to contain twelve intact torpedoes (six in the tubes and six reloads) fitted with contact exploders.²¹²

The primary British pistol of the Second World War was the Type 3 contact pistol. Although the British had experimented with magnetic detonation during the prewar years and would actually achieve success with this method of detonation later in the war during the famous raid on the Italian Fleet at Taranto, the Admiralty had already decided years ago that this type of detonation “contained too many variables to guarantee consistent performance in all conditions of combat” and so turned all their attention to the perfection of the impact pistol.²¹³ The result was the Type 3 contact pistol, which was of a much simpler design than the German version, and was overall much more reliable. Detonation was achieved through a so-called “spinner,” a device which, in the confusing technical terminology used by Rössler, “combined the nose-cross

²¹⁰ Dan van der Vat, *The Atlantic Campaign: World War II's Great Struggle at Sea* (New York: Harper & Row, 1988), 114

²¹¹ It is of course possible to jettison torpedoes (i.e. shooting them out of their tubes), but for whatever reasons this was not done by the crew of the *Seal*.

²¹² Blair, 160

²¹³ Records of the Admiralty, C.B. 3002/27, “Progress in Torpedo, Mining, Anti-Submarine, and Chemical Warfare, 1929,” File ADM 186/476, National Archives of the United Kingdom, 4, cited in Newpower, 32

with the gripping arms and the safety propeller in the form of a six armed star.’²¹⁴ During the run this star slowly turned around its axle and in this manner cocked the firing pin spring which allowed a detonation of the priming charge. The spinner was mobile on all sides and in the impetus of impact released a spring, which struck the impact pin to the rear and caused the ignition.²¹⁵

The advantage of the English pistol over the German is quickly evident from a comparison of German submarine attacks versus British during the Norway campaign. Although the British submarine force for obvious reasons never occupied in its country the grand status that the *U-Bootwaffe* attained in Germany, it nevertheless put on an impressive performance. On April 8 the Polish submarine *Orzel*, which had since the beginning of the war been placed under British command, sank the German transport liner *Rio de Janeiro* as it attempted to carry hundred of German invasion troops to Bergen. The same day, Lieutenant Commander A.G.L. Seale, commanding the HMS *Trident*, sank the 8,036 ton tanker *Posidonia* in the Skagerrak. On the 9th, HMS *Truant*, commanded by Lieutenant Commander C.H. Hutchinson, sank the German cruiser *Karlsruhe*, which had earlier participated in landing German troops at Kristiansand. At this same time, Lieutenant Commander Slaughter of HMS *Sunfish* sank three German ships in a convoy in the Skagerrak, while Lieutenant Commander J.H. Forbes of HMS *Spearfish* achieved a torpedo hit on the pocket battleship *Lützow*, which put her out of action for the remainder of the year. On April 14, Lieutenant William King of HMS *Snapper* managed to sink three vessels from a German convoy. All in all, during the five weeks of the Norwegian campaign, British submarines sank eighteen merchant vessels totaling more than 60,000 tons.²¹⁶ Although part of

²¹⁴ Rössler, *Die Torpedos der deutschen U-Boote*, 108

²¹⁵ *Ibid.*, 108-109

²¹⁶ *Newpower*, 55-57

this success must also be attributed to the British Mark VIII torpedo's superior depth control system, it is certain that the superior contact pistol also played a substantial part.

Dönitz saw the Type 3 contact pistol as a potential short term solution to the German detonator problem and accordingly urged OKM to begin full scale of production of the English pistol for immediate use in the *U-Bootwaffe*. In this way it was hoped to provide the U-boats with an immediate short term fix while the technical personnel at the Torpedo Inspectorate perfected the German AZ setting. In late May OKM gave the TI permission to begin introducing the English pistol to the fleet, with initial priority going to the *U-Bootwaffe*. It further authorized the TI to use any and all available means to hasten the production of the Type 3 so that it might be fully integrated to the front by the middle of August.²¹⁷

The *Seal* incident and the resulting copying of the English Type 3 pistol is frequently seen as being the primary way by which the Germans were able to correct their contact pistols. Clay Blair writes that "After Dönitz and his staffers had closely examined the pistols, Dönitz declared them to be 'very sound' and 'efficient' and he insisted that they be 'copied.' Cornelius concurred, and by this means the Germans were able to produce a reliable contact pistol in a very short time."²¹⁸ In contrast to this, the German author Eberhard Rössler seems to deemphasize the role of the Type 3, noting that while the English pistol was more reliable than its German counterpart, tests of the Pi 40 (the German re-designation of the Type 3) carried out in Eckernförde alongside its manufacture showed that the large star-shaped propeller when placed on German warheads so unbalanced the torpedo during its run that nearly every torpedo fired ended up being a ground runner. In other words, the extra weight added to the front of the torpedo by the spinner forced the torpedo downward during the run until it ended up burying its

²¹⁷ "Oberkommando der Kriegsmarine Abschrift Betrifft: Einführung einer englischen Pistole," B.Nr. T Wa Ia 2680/40 GKds, 23.5.1940, PG 34634, National Archives Microfilm Publication T-162B, Roll 2346

²¹⁸ Blair, 160

nose into the mud. Hence, for all its promise, the practical application of the Type 3 was not possible and production was discontinued. However, although an exact replication and production of the “spinner” device did not prove feasible, the Type III’s method of detonation via the inertia of a movable mass which “kicked back” to the rear was studied and applied in later modifications to the contact pistol, and in this way contributed to improving the German AZ setting.²¹⁹

One of the more predictable consequences of any kind of debacle is the search for responsibility and assigning of blame. That someone would have to pay the price for the failure at Norway was evident in the formation of Raeder’s special committee of investigation, as any investigation into the causes of technical failure could not help but extend itself to the technicians as well. That a formal court of inquiry would later take place is obvious from the content of Raeder’s memorandum of June 11 issued in response to the rising criticism of German torpedoes following the Norwegian campaign. In addition to saying how he felt more strongly than anyone about the failures that had recently come to light, Raeder went on to say that “By means of commissions of enquiry I have sought to establish whether there have been avoidable faults on the part of officers, officials or employees, and the Officer Corps may rest assured that if this is shown to be the case *I shall bring the guilty persons to account with merciless severity.*”²²⁰ Thus there was no surprise when twelve days later on June 23 Raeder ordered the opening of Preliminary Proceedings through the Reich War Court to establish the question of responsibility.²²¹

²¹⁹ Rössler, *Die Torpedos der deutschen U-Boote*, 110

²²⁰ Memorandum issued on June 11, by the Supreme Commander, German Navy, in answer to criticism of German Torpedo Failures and of the Naval Shipbuilding Programme, as cited in Bekker, 375 [emphasis added]

²²¹ Rössler, *Die Torpedos der deutschen U-Boote*, 87

The following findings as summarized by Räder in an OKM document dated July 23

were released by the Court of Inquiry:

- 1). Weaknesses of the Torpedoes and lack of preparation before the delivery of torpedoes to the front were decisive in
 - a). Depth-keeping and depth run in both the G7a and G7e did not meet the needs of a reliable weapon
 - b). The pistol in its MZ setting was not technically reliable. The AZ setting did not fulfill the demands of reliability placed upon it.
 - c). At the Kiel Navy Yard Torpedo Department and in shooting trials at the TVA shortcomings in the preparation of the torpedoes prior to their delivery to the front have been established.
- 2). The investigation committee has now found:
 - a). Responsibility for the fact that the depth-keeping of the G7a and the G7e was not satisfactory lies with the leader of the TVA from 1936-1939, Rear Admiral Wehr and Dr. Rothemund.
 - b). Responsibility for the shortcomings of the G7a pistol lies with Rear Admiral Wehr, Assistant department head Dr. Schreiber, Chief Government Inspector (*Oberregierungsbaurat*) Dr. Rothemund and in part with Government Inspector (*Regierungsbaurat*) Wissussek.
- 3). I [Raeder] have decided:
 - a). To send the matter to the president of the Reich War Court with the request to immediately begin investigation proceedings against Rear Admiral Wehr, Assistant department head Dr. Schreiber, Chief Government Inspector Dr. Rothemund, Government Inspector Wissussek, as well as certain members of the technical staff
 - b). With immediate effect Rear Admiral Wehr is relieved of his duties
 - c). Dr. Schreiber and Dr. Rothemund are with immediate effect forbidden to return to head their respective departments.
- 4). Vice Admiral Götting, chief of the *Torpedowaffe* department of OKM is to be suspended from his duties during for the course of this investigation.²²²

After the taking of evidence on May 27, 1941 charges were officially levied against the then heads of the TI and TVA, Vice Admiral Götting and Rear Admiral Wehr, as well as against Dr. Schreiber and Dr. Rothemund. Götting and Wehr in particular were accused of failing to inform the Navy of the insufficient testing of the AZ setting of the Pi G7a before the war and also for failing to undertake sufficient torpedo tests during their time in office. Dr. Schreiber and Rothemund were accused of failing to pay adequate attention to the Pi-G7a in both the MZ and

²²² "Der Oberbefehlshaber der Kriegsmarine Abschrift Betrifft: Untersuchung der Torpedoersager," B. Nr. M 261/40 G.Kdos, 23.7.1940, PG 34634, National Archives Microfilm Publication T-162B, Roll 2346

AZ parts and also for failing to undertake adequate testing to uncover any deficiencies. In December 1941 the verdicts were delivered. Vice Admiral Götting was acquitted of all charges, while the other three defendants were sentenced to between two to four years imprisonment, but this was later adjusted to probation which in turn was eventually forgotten about as the war progressed.²²³ In practice, the three defendants endured six months imprisonment each, after which time Schreiber and Rothemund were both allowed to return to armaments work.²²⁴

It should also be mentioned that Ronald Spector in his book *At War at Sea: Sailors and Naval Combat in the Twentieth Century*, says that death sentences were actually handed out, citing Hessler's *The U-Boat War in the Atlantic* as his source, which upon further examination actually fails to mention any such thing. Unless Spector is referring to a different edition that is not mentioned or known, the reason's for his assertion are unknown, and are most assuredly not true.²²⁵

Another important consequence of *Hartmut* was the reorganization of the TVA. Aside from its doubling in size, from 3,100 persons in the fall of 1939 to 6,200 in the spring of 1940, in the main this concerned the division of the technical branch into two departments, with a naval officer in each case being appointed to its head. Moreover, incorporated into these new departments were the military advisors from the military division.²²⁶

²²³ Rössler, *Die Torpedos der deutschen U-Boote*, 88

²²⁴ Van der Vat, 116

²²⁵ Ronald Spector, *At War at Sea: Sailors and Naval Combat in the Twentieth Century* (New York: Viking Penguin, 2001), 213

²²⁶ Rössler, *Die Torpedos der deutschen U-Boote*, 89-90

Chapter 5

The *Torpedokrise* Phase III: The First Happy Time (May-December 1940)

Resumption of Atlantic Warfare

While these changes and improvements within the *Torpedowaffe* were taking place, a larger debate of immense implications took place within BdU headquarters. Once the whole picture of U-boat performance during *Weserübung* became clear, it was impossible to avoid the question of whether, in view of the terrible state of the German torpedo, a return to Atlantic U-boat warfare was advisable. Was it, to use Prien's words, fair to send Germany's submariners back out on patrol armed only with a "wooden sword"? For a time this question could be put off. Both the surface fleet and the U-boat arm were so bruised after Norway that neither of these elements played a role in the invasion of France that May, except for a few reconnaissance patrols by some of the coastal U-boats. But as the crews became rested and the boats repaired, this all-important question again emerged at the forefront of discussion.

Several persons within BdU, including Dönitz' own chief of staff, Eberhard Godt, argued that it would be unwise to send the boats back into battle before the torpedo defects had been completely eliminated. Dönitz was of a different opinion. The entire U-boat force had already lain idle for several weeks now. To leave the boats and their crews tied up at their berths while they waited indefinitely for the torpedo problem to be resolved was to risk an even greater drop in morale than that occasioned by the failures themselves, to say nothing of the decline in the

crew's fighting efficiency.²²⁷ His opinion on the matter is well expressed in an entry in his war diary on May 22:

It is quite clear to me that I must expect a further considerable number of failures due to the known defects of the AZ, but I have no choice, unless I withdraw the boats altogether. But I cannot lay the boats up now, of all times, without damaging the whole arm to an unpredictable degree. As long as there is the chance of a small percentage of success, operations must be continued."²²⁸

His decision was probably influenced in no small way by the painful memory of the 1918 mutiny of the High Seas Fleet. Every German naval officer of the Second World War was haunted by the fact that it had been the mutiny of their branch of service that had sparked the infamous 1918 revolution which in their minds had cost Germany the war. As a young naval officer in the last war Dönitz would most certainly have remembered this and been ashamed by it. More importantly, he would have remembered that it was the months and years of lying idle in port with nothing to do that had so demoralized and radicalized the sailors of the fleet, creating the conditions for mutiny in the first place. It is reasonable to conclude that he was determined to avoid a similar drop in morale that prolonged inactivity would bring.

Encouraged as well by the findings of Dr. Cornelius, who promised great improvement both in the depth-keeping and the magnetic pistol, Dönitz resolved to resume operations in the Atlantic as early as possible. In the meantime he initiated steps to restore the somewhat flagging morale of the crews. Medals were awarded – Schuhart among others received the coveted *Ritterkreuz* (Knight's Cross) – and both Dönitz and Raeder personally paid several visits of encouragement to the various crews. Finally, a few key personnel changes were made. Werner Hartmann, the skipper of U-37, was assigned to duty on Dönitz' staff and was replaced by Viktor Oehrn. Sohler, the commander of U-46, was relieved for reasons of nervous exhaustion and

²²⁷ Blair, 160

²²⁸ Dönitz, FdU/BdU KTB, 22.5.1940, PG 30265, National Archives Microfilm Publication T1022 series, Roll 3979, 71-72

reassigned to shore duty. Schultze, although he had performed brilliantly, was temporarily relieved of duty after being diagnosed with a serious stomach disorder.²²⁹

Dönitz planned to begin his new Atlantic offensive with a maximum commitment of force spread out over as large an area as possible, but his plans were frustrated by the demands of Hitler and the OKM that some of his U-boats be used to transport supplies to Norway. Dönitz was therefore obliged to reschedule the start of operations to the beginning of June. Going on the word of Dr. Cornelius, Dönitz at this time also gave the green light for use of the MZ pistol, but only in the Atlantic area. On May 22 he answered in the negative to a query from the Naval War Staff of whether it might now be possible to operate boats off of Narvik, stating that “it is certain that MZ does not function in that sea area, although there is still hope that better results may be obtained with this from firing in the Atlantic.”²³⁰

Unfortunately, this did not prove to be the case, and the campaign got off to a rocky start when on May 23 Viktor Oehrns U-37 reported two premature detonations, two pistol arming failures, and one erratic runner out of five shots. Prior to this, Dönitz had refrained from abandoning magnetic firing because impact firing had led to practically nothing but failures during October and April and because during that same period of time the MZ setting had brought many successes in the Southern and Central North Sea and in the Atlantic during February. Moreover, despite indications that the enemy was degaussing their ships, Dönitz had hoped that use of the MZ might achieve some results in the open sea while the AZ was being perfected. U-37’s report however altered everything. As in his opinion “magnetic firing has become almost useless,” on May 23, the same day that he ordered that the English pistols

²²⁹ Blair, 160-161

²³⁰ Dönitz, FdU/BdU KTB, 22.5.1940, PG 30265, National Archives Microfilm Publication T1022 series, Roll 3979, 71

recovered from the *Seal* be copied, Dönitz decided to abandon MZ firing altogether and to go over exclusively to AZ setting using switch setting A.²³¹

Dönitz relayed his decision to the fleet on June 1. In the same communication he further specified that as an additional improvement the contact pistols were to be inserted with an “electric contact,” basically an ignition battery, by which “it is hoped that . . . a large proportion of AZ failures will be avoided.”²³² As would be seen the incorporation of the ignition battery represented a significant improvement in ensuring reliable detonation. To ensure that it was properly maintained, the TI specified that the old batteries should be exchanged for new ones at the nearest Torpedo Department every five months.²³³ To reduce the chances of failure of the whiskers on contact, commanders were also ordered to fire using the broadest possible track angle [the angle of the torpedo’s run to the target],²³⁴ as impact ignition was guaranteed at a hit angle of thirty degrees, and was also reckoned to be effective at twenty-one degrees. In addition to announcing some changes regarding the letter designation of the pistols, U-boats were said to expect the delivery of pistols with a firmer security run setting of 150 meters.²³⁵ Finally, on the basis of new findings regarding the heat and cold resistance properties of lubricants, a new type of “acid free, non resinifying machine oil” was prescribed for the lubrication of the torpedo tubes, as the old type of lubricant was judged inadequate to preventing failures due to extreme cold temperatures.²³⁶

²³¹ Ibid.

²³² Ibid., 72

²³³ “Torpedoinspektion Schnellkurzbrief Betrifft: Torpedo-Gefechtpistole,” B. Nr. G 8174 T, 24.9.1940, PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

T-1022 series

²³⁴ Hessler, 27

²³⁵ “Marinenachrichtendienst 0141,” B. Nr 929, sent 1.6.1940 0905 hours, PG 34634, National Archives Microfilm Publication T-162B, Roll 2346

²³⁶ “Torpedoepröbungs-kommando Abschrift Betrifft: Schmierung der Torpedo-Ausstossrohre,” B. Nr. G 2269 R, 1.6.1940, PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

The decision to switch exclusively to AZ detonation paid off immediately. In the next few days after making the switch Oehrn sunk three ships by torpedo, including a nice 10,500 ton French freighter, the *Brazza*. He would finish his patrol by sinking a further six vessels, one by demolition, four by gun, and one by a combination of gun and torpedo. When Oehrn returned to Wilhelmshaven on June 9 and everything was tallied up, it came up to ten ships sunk for 41,200 tons. This turned out to be a record first patrol in terms of ships sunk.²³⁷ Dönitz was of course ecstatic. This was the kind of success necessary to win the war on shipping and also to restore the shaken moral of the U-boat crews. As events were to show, it also made a return to MZ detonation increasingly unlikely, at least for the foreseeable future.

For the purposes of our study, Oehrn's patrol is a critical turning point, marking the end of the Norwegian crisis period and the beginning of the U-boat heyday known as the "Happy Times," a six month period during which individual commanders such as Prien, Schepke, Kretschmer, and others went on to rack up gigantic sums of tonnage for themselves. Over the course of this period, from late May until the end of the year, a total of 312 ships totaling some 1,649,217 gross tons would be sunk in the North Atlantic.²³⁸ This of course worked wonders on morale. As Newpower says, "if the Norwegian campaign destroyed the crew's faith in their torpedoes, the Happy Time restored it."²³⁹ The timing of the torpedo's improvement could not have been better, coinciding as it did with Hitler's granting of highest priority to U-boat construction.

Of course, improved torpedoes were not the only factor accounting for this staggering success. The defeat of France opened the French Atlantic ports for use by the *U-Bootwaffe*, a point that Dönitz was quick to recognize. Sailing from the ports of Brest, Lorient, St. Nazaire,

²³⁷ Van der Vat, 129

²³⁸ Blair, 711-713

²³⁹ Newpower, 53

La Pallice, and Bordeaux, the U-boats were able to eliminate the entire cumbersome, dangerous, and time consuming route around Scotland via the North Sea which they had previously had to take. The ports themselves, particularly at Lorient and St. Nazaire, were fully staffed and capable of providing fast refit times for returning boats. The initial shortage of torpedoes had by now been overcome, most of the constraining rules of the *Preisenordnung* had by now been done away with, accurate intelligence on British convoys was being provided on a timely basis by *B-Dienst*, and moreover the convoys themselves were more thinly escorted.²⁴⁰

Having entered the “Happy Times” period, a brief overview of statistics for the preceding period is in order. During this time from the middle of November 1939 to June 12, 1940, the U-boats had fired a total of 531 torpedoes equipped with the Pi A+B pistol. Of the 531 torpedoes a total of 440 employed the magnetic setting. Of these, forty-three torpedoes (9.8%) were categorized as “self-detonators.” Nine torpedoes (2.0%) were “early detonators.” Sixteen (3.6%) were “electric detonators,” while a further thirty-three were “miss detonators” (*Fehlzündungen*).²⁴¹ Obviously this is a rather complicated system of classification, and it is not necessary for the purposes of this study to know the exact meaning of each of these vague sub-categories. What is pertinent to this study is that tallying up all the individual sub-categories together reveals a total of 101 torpedoes for 23 percent of the total torpedoes fired that spontaneously exploded without hitting either the target or another object. Any of these explosions could have been noticed by an accompanying escort vessel, alerting it to the U-boat’s location and hence jeopardizing the safety of the U-boat and its crew.

²⁴⁰ Blair, 192

²⁴¹ “Auswertung der bei der Torpedoinspektion seit Mitte November 1939 (Einführung der Pi A+B) bis zum 8.7.40 eingegangenen Schußmeldungen von U-Booten,” B. Nr. 9138 1939/40, PG 34634, National Archives Microfilm Publication T1022 series, Roll 2346 [most recent firing dated 12.6.1940]

For the surface ships the numbers are as follows. Since the beginning of the war to the June 11, 1940, surface vessels had fired a total of 142 torpedoes, eighty-two of which were without data, meaning only sixty of these could be evaluated. Of these only one torpedo used the MZ setting, which appeared to function as it should. The sixty torpedoes were fired in forty-five shots (discounts for fan shots). Of these only eleven (24.4%) were hits, twenty-three (51.1%) were misses, while eleven (24.4%) were failures of some kind.²⁴²

Dönitz' decision to switch over exclusively to AZ firing was a resounding success. Perhaps the best indication of the extent to which the AZ pistol had by now been improved is the fact that from the period of June 1, 1940, to the beginning of July 1941, with the one exception of June 29, 1940, Dönitz does not make a single mention of torpedo failures anywhere in his war log. This is certainly significant, as prior to this period torpedo failures are perhaps the most common topic. One consequence of the great success of the AZ pistol was the increasing unlikelihood that a switch back to MZ detonation would be undertaken anytime soon. Indeed, as events were to show, this transition from MZ to AZ detonation was to be relatively permanent, as MZ detonation would not be used again until 1942. Dönitz' decision of May 23, 1940, to stop using the MZ setting represents a crucial turning point in the mentality of the *U-Bootwaffe*.

Hitherto the torpedo authorities had been completely enamored with the enhanced destructive potential of magnetic detonation to the extent that AZ development had been all but ignored. Even in the depths of the torpedo crisis, when the deficiencies of the MZ were becoming increasingly obvious, the torpedo authorities had still looked to the MZ as the answer to many problems. They continued to urge BdU to reapprove MZ detonation as soon as any small change was made to it, and they refused, at least in the early period of the crisis, to admit

²⁴² "Auswertung der bei der Torpedoinspektion seit Kriegsbeginn bis zum 3.7.40 eingegangen Schußmeldungen von überwassertorpedoträgern," B. Nr. 9138 1339/40, PG 34634, National Archives Microfilm Publication T1022 series, Roll 2346 [most recent firing dated 11.6.1940]

that the MZ itself could be at fault. Events had now reached the point, or rather had gotten so bad, that the Navy and torpedo authorities no longer saw the realization of the MZ's incredible potential as the primary area of focus, but were now only concerned with finding something, anything, that worked.

Further Improvements to Pistols and Depth Control

While the Torpedo Inspectorate certainly had good cause to be satisfied with the performance of its torpedoes during the "Happy Times," this did not stop it from striving to improve them even further. For the rest of 1940 the TVA would work diligently to deliver the new pistols to the front, as well as to further improve the contact pistol as well as depth keeping.

From June 4 onwards only Pi A+B pistols incorporating the supposedly improved MZ setting, the improved AZ mechanism, and a fixed security run of either 150 or 300 meters were being manufactured by the TVA. Pistols using the 150 meter security run were given the designation "Pi-Rot" and were used only with U-boats, torpedo boats, and S-boats. The name came from the fact that the old designation (A+B) which was marked on the hood cap and the packing containers were crossed out in red, the security run ring was repainted red, and a red ring was painted on the packing case. For the pistols that armed after a security run of 300 meters the same markings were applied, only in blue, thus earning it the name "Pi-Blau." These pistols were only put on torpedoes to be used by destroyers and other surface ships. For the time being, use of both types of pistols was only authorized in the AZ setting, which should guarantee a detonation with an impact angle of up to twenty-one degrees. As depth keeping was now thought to be improved within a variation of 1.5 meters, the depth setting was to be three meters

less than the target's draught, but no less than three meters depth in order to avoid the possibility of a surface runner. Torpedo boats and S-boats, however, were given permission to use a two meter depth setting in good weather conditions. At the same time commanders were instructed to turn all pistols not adhering to the above specifications over to the nearest torpedo department to be converted.²⁴³ By way of monitoring the situation, the TI periodically sent out memos and additional reminders to the boats, which often asked them for specific pieces of information. For example on September 24 the TI asked the boats to report the exact count and number of each pistol carried on board and to deliver all as yet unaltered pistols carried on board to the nearest Torpedo Department for conversion.²⁴⁴

Great things were expected by the TI of the new depth control device, the *TA I*, which was marked by a green ring on the *Tiefenapparat* cover plate, and its introduction to the front was an eagerly anticipated event. The limited testing that had been done thus far had been most successful. Depth-keeping, although still not perfect, seemed to have narrowed down to a three meter window of plus or minus 1.5 meters. Moreover, close range shots conducted at the highest of speeds had showed no inclination so far to break the surface, even when set at a depth of only two meters, a fact which led to TI to consider reversing its long in place ban on *Schnellschusse* firing with the G7a. (Torpedoes that were shot forward of the beam at high speeds using the shallowest depth setting would on occasion break the surface.²⁴⁵) Based on these results, on June 20 the following instructions were issued: *Schnellschusse* firing was again permitted, and the depth setting of the target's draught minus three meters for the AZ setting was prescribed. Depth

²⁴³ "Torpedoinspektion Abschrift Betrifft: Ausrüstung mit Gefechtpistolen für G7a und G7e Torpedoes," B. Nr. Gkds. 1068, 4.6.1940, PG 34634, National Archives Microfilm Publication T-162B, Roll 2346

²⁴⁴ "Torpedoinspektion Schnellkurzbrief Betrifft: Torpedo Gefechtpistolen," B. Nr. G 8174 T, 24.9.1940, PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

²⁴⁵ "Torpedoinspektion Schnellkurzbrief Betrifft: Torpedoschuss in vorlicher Schussrichtung," B.Nr. G 8200 T, 25.9.1940, PG 34427/76, National Archives Microfilm Publication T-1022, Roll 3895

was not to be set at less than three meters, however, except during excellent weather conditions, when a setting of two meters was approved.²⁴⁶ These new settings would certainly have been welcomed by the U-boat commanders, as it meant that destroyers could once again be attacked.

Initially, the *TA I* had been fitted to torpedoes incorporating improved engines, which during trials had demonstrated a corresponding improvement in performance. Initially it was thought that all new depth-altered torpedoes would be fitted with these new engines, but by July 30 it was decided that in order to secure the largest number of new torpedoes in the shortest amount of time, the new torpedoes would for the time being do without this other improvement. As a result of this the *Schnellschusse* ban, which had just been removed on the 20th of the previous month, was again re-instated. This decision also led to some initial confusion in determining which of the existing torpedoes had the improved engines and which did not, as both incorporated the same green ring that marked the *TA I*. Eventually, the green ring would come to denote only those torpedoes which had been fitted with the *TA I*.²⁴⁷

The issue of the improved engines continued to circulate within many circles. Talk focused on whether it would be prudent in view of the potential possibility to use the *Schnellschusse* to invent a second designation to delineate those torpedoes containing both an improved engine and the *TA I* from the newer torpedoes containing the *TA I* only. This exact idea was suggested to the TI by FdZ (*Führer der Zerstörer*) on August 6, 1940.²⁴⁸ Four days later, however, this suggestion was turned down by the TI on the grounds that the TVA, in order

²⁴⁶ "Torpedoinspektion Schnellkurzbrief Betrifft: Tiefeneinstellung," B. Nr. G 4980 T, 20.6.1940, PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

²⁴⁷ "Torpedoinspektion Schnellkurzbrief," B.Nr. G 6347 T, 30.7.1940, PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

²⁴⁸ Führer der Zerstörer Abschrift Betrifft: G7a Torpedo mit aptiertem Tiefenapparat," B. Nr. G 2489 A2, 6.8.1940, PG 34427/76, National Archives Microfilm Publication T-1022, Roll 3895

to keep up with the increased demands from the front, was no longer conducting *Schnellschüsse* shots in Eckernförde.²⁴⁹

Finally, in addition to the changes in and the new regulations issued for the new impact pistol and the *Tiefenapparat*, two other unrelated discoveries took place that are briefly worth mentioning. During the summer of 1940 the TI launched an investigation into the causes of the oft-reported instances in the past whereby torpedoes would inexplicably run off course after being launched. The TI attributed this behavior to “prolonged vibration of the G.A. [*Geradelaufapparat* – course stabilization device] incurred during transport or while on board the boat.” This can be explained as follows: the straight ahead motion of the torpedo was governed by a device found within the torpedo known as the *Geradelaufapparat*, commonly abbreviated as G.A. This device was extremely sensitive, so much so that it could, they speculated, be thrown out of sync by the jolts and bumps that it encountered either as a result of improper handling during its delivery to the front, or once delivered, through some violent motion such as that resulting from being depth-charged. Pending the results of this investigation, the TI suggested that two measures be taken. First was the rather vague and obvious, and as such probably unhelpful, suggestion that all efforts be made to secure and protect the tail piece of the torpedo (in which the GA was located) from violence or unnecessary stress. Second was the more helpful proposal that the firm seating of the locking nuts for the clutch nuts of the rudder linkage should be inspected/proofed as often as possible (*Der feste Sitz der Gegenmuttern für die Kupplungsmuttern der Rudergestänge ist möglichst oft nachzuprüfen*).²⁵⁰

²⁴⁹ “Torpedoinspektion Schnellkurzbrief Betrifft: G7a Torpedo mit aptiertem Tiefenapparat,” B. Nr. G 6681 T, 10.8.1940, PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

²⁵⁰ “Torpedoinspektion Abschrift Betrifft: G.A. Störungen,” B.Nr. G 7665 T, 18.9.1940, PG 34427/76, National Archives Microfilm Publication T-1022, Roll 3895

Summary of 1940 and a Look at 1941 and Beyond

Thus the year 1940, which had begun so badly for the Germans, ended on an extremely high note. This year, which was by far the most critical period during the *Torpedokrise*, can be divided into three distinct parts: a terrible beginning which culminated in the Norwegian fiasco, a month long period of reorganization and reassessment during which the modifications begun by Kummert the previous December would finally be felt, and finally the resulting period of spectacular success known as the “Happy Times.” During this time of reorganization the torpedoes had been improved to the point of being considered moderately reliable. Torpedo failures continued to occur, to be sure, and would on occasion rob commanders of great success, but by and large their presence would now constitute a nuisance rather than a decisive element upon which hinged the success or failure of an entire operation, or even campaign. The range of malfunctions had also been reduced. Up to this point, torpedo malfunctions were almost always one of three types: problems with the AZ contact pistol, problems with the MZ magnetic pistol, and problems with depth. Thanks to the discovery of the defective 4 whiskered pistol and the inadvertent help given by HMS *Seal*, the AZ contact pistol had been vastly improved. Embarrassing incidents, for instance, in which a torpedo would actually strike the side of a ship and fail to detonate largely disappeared. Although improved, depth-keeping continued to be a problem even after the installation of the *TA I*, and another year would pass before it was finally remedied. As will be seen, the suspect depth-keeping negatively affected the performance of the AZ by requiring commanders to set their torpedoes to run at a much shallower depth setting than was ideally desirable. In the instances where the torpedo did hold to its set depth, this had the adverse effect of re-directing most of the warhead’s blast to a more undesirable, shallower spot,

thus depriving the torpedo of its full effectiveness. Finally, the MZ continued to perform dreadfully, but Dönitz' decision to switch entirely to the AZ effectively cancelled this weakness out. As it was the MZ would play no further part in operation until it was significantly improved in late 1942.

Additionally, as pertains to the timeline of this study, the beginning of “Happy Times” presents us with a kind of chronological dilemma – when, in other words, should we end our discussion of the “*Torpedokrise?*” For example, torpedo failures continued to occur right up to the very last days of the war, but obviously the entire war did not constitute a Torpedo Crisis. Strictly speaking, never again did torpedo failures reach the catastrophic proportions of the Norwegian campaign, and never again, to use the words of Karl Dönitz, would “the problem of where to operate the boats depend on the question: will the torpedo work”? As such, it might seem plausible to follow the example of other historians and conclude our summary of the *Torpedokrise* right here in the midst of German success during the first Happy Times. I would contend that torpedo failures, particularly the lingering problems with depth as well as the implications of Dönitz' decision to switch exclusively to impact detonation, were nevertheless crucial in explaining the failure of the *U-Bootwaffe* to sink enough ships to defeat Britain before the closing of the already alluded to window of opportunity. The way in which this played out was particularly evident during Operation Drumbeat – the campaign off the American coast in early 1942. Therefore, the remainder of our chronological summary will proceed as follows: 1). A discussion of the end of the First Happy Times, marked by the sudden onset of a rash of torpedo failures in February 1941, as well as by the death or capture of several of Germany's more premiere U-boat commanders, such as Prien, Kretschmer, Schepke, etc. 2). The re-emergence of torpedo failures as a popular subject in Dönitz war log. 3). The harmful impact of

the switch to AZ firing only as shown during the campaign off the American coast. 4) The correction of the final problems with depth and magnetic detonation.

End of the First Happy Times (February and March 1941)

1941 did not begin well for the *U-Bootwaffe*. Two negative occurrences would arise that would signal the ending of Happy Times, and the beginning of yet another period of difficulty. The first was a sudden rash of inexplicable torpedo failures beginning in February of that year, and the second was the equally sudden loss of several of Germany's top U-Boat aces, all of which occurred within a very short interval.

In the main these renewed torpedo failures concerned attacks on two convoys, OB 288 and OB 289, both of which were far less successful than had been anticipated by Dönitz. On March 17, in response to "numerous unexplained failures and surface runners," which "gave rise to deep anxiety as regards the torpedo question," the following was reported: U-37 experienced nine unexplained misses and failures between February 8 and 10. U-107 had three unexplained misses and a surface runner between the February 3 and 23. U-69 had three unexplained failures and two surface runners between the February 12 and 24. U-97 had five unexplained misses on the 24th, while U-73 had a surface runner on the 24th. In addition, U-552 had seven unexplained failures on the 23rd while U-147 had two unexplained misses at the end of the month. These failures, occurring as they did after a "very uneventful six months in [the] torpedo situation," were quite puzzling to Dönitz, who immediately requested that Dr. Cornelius come see him in Lorient for "further enquiry and an intensive examination of the situation on the spot."²⁵¹

²⁵¹ Dönitz, FdU/BdU KTB, 17.3.1941, PG 30285, National Archives Microfilm Publication T1022 series, Roll 4063, 36-37

Privately Dönitz was of the opinion that low temperatures were in some way responsible, as all of the boats in question had been fitted out in home waters around Germany during cold weather. Further proof of this lay in the fact that boats which had been fitted out in Lorient, where the weather had been more mild, had not reported any failures as of yet. Acting on these beliefs, Dönitz instructed all the fitting-out depots not to issue the boats any torpedoes which had been exposed to extreme weather conditions after initial trials and also demanded that the TI test torpedoes in all conditions that they were likely to experience before they were used in action.²⁵² Dönitz' theory seemed to be correct, for the problem disappeared as rapidly as it had arisen with the arrival of warmer weather in March 1941.

The second indication of the end of Happy Times was far more serious than the first, for it was not something that could simply go away with better weather. During this month, March 1941, a total of five boats and five commanders – three of which were Knight's Cross winners – were lost at sea. The bad news began on the 8th when Günther Prien (thirty-one ships sunk for 191,919 tons), the “Bull of Scapa,” was killed when U-47 was lost with all hands in a convoy battle south-southeast of Iceland. The circumstances for the sinking are not entirely clear – the traditional idea has been that U-47 was sunk by HMS *Wolverine*, although there is also speculation that U-47 may have been hit by one of her own circling torpedoes, which if true, would have been a particularly costly loss resulting from a torpedo failure. That same day U-70, commanded by Joachim Matz (seven ships sunk for 27,375 tons) was lost, although unlike Prien he managed to survive and spent the rest of the war in captivity in Canada. The 17th was again another double event, although one that was even more costly than that of March 7. Knights Cross winner Joachim Schepke (37 ships sunk, 155,882 tons), nicknamed the best looking officer in the *U-Bootwaffe*, was killed early that morning when his boat, U-100, was

²⁵² Ibid.

rammed on the surface by HMS *Vanoc* after being depth-charged by both *Vanoc* and HMS *Walker*. An even greater loss was “Silent Otto” Kretchmer (Knights Cross, 47 ships sunk, 274, 418 tons), the “Tonnage King,” who was lost in the same battle as Schepke, being captured by the British after scuttling U-99, which had also been depth-charged by HMS *Walker*. The dreadful month was finally rounded off with the loss of U-551 commanded by Karl Schrott (no ships sunk), which was sunk with all hands by the trawler HMS *Visenda*.²⁵³

The cracking of the German Enigma cipher in the second half of 1941 combined with the development and successful implementation of Allied technological advances such as high frequency direction finding (Huff-Duff) made the rest of 1941 a very quiet year from our perspective. There were few engagements as many Allied convoys were simply re-directed around the waiting packs of U-boats. Consequently the reports of torpedo failures, which were beginning to reappear in Dönitz’s KTB, were also limited and scattered. The reports that are mentioned by Dönitz are listed here: on June 17 U-371 experienced three failures when firing recovered torpedoes, one of which was a pistol (Pi) failure. She did manage to sink a 9,800 ton freighter however.²⁵⁴ Three days later U-73 likewise experienced a Pi failure as well as two more of unknown origin,²⁵⁵ while on the 22nd U-141 had a Pi failure and a surface runner.²⁵⁶ To close out the month, U-552 experienced one failure.²⁵⁷ In early July, U-66 experienced a total of eight failures (three Pi failures and five others of unknown origin), while managing to sink three

²⁵³ Statistics of all tonnage sunk per mentioned individual U-boat taken from www.uboot.net

²⁵⁴ Dönitz, FdU/BdU KTB, 17.6.1941, PG 30291, National Archives Microfilm Publication T1022 series, Roll 4063, 93

²⁵⁵ Entry of June 20, 1941, *ibid.*, 95

²⁵⁶ Entry of June 22, 1941, *ibid.*, 96

²⁵⁷ Entry of June 27, 1941, *ibid.*, 99

ships.²⁵⁸ For almost the next six months, there was only one other mention of a failure, when a torpedo from a four shot fan fired from U-751 failed during an attack on a destroyer group.²⁵⁹

²⁵⁸ Dönitz, FdU/BdU KTB, 2.7.1941, PG 30292, National Archives Microfilm Publication T1022 series, Roll 4063, 105

²⁵⁹ Dönitz, FdU/BdU KTB, 22.12.1941, PG 3031B, National Archives Microfilm Publication T1022 series, Roll 4063, 278

Chapter 6

Torpedokrise Phase IV: The Second Happy Time (January – August 1942)

Obviously the single great event of 1941 from the naval perspective was the entry of the United States into the war. Oddly enough, the formal declaration of war against the United States came as quite a relief for the *U-Bootwaffe*, which for all intents and purposes was already in a de-facto if undeclared state of war with the American Navy as a result of Roosevelt's rather loose interpretation of American "neutrality." For example, although the U-boats were under strict orders to avoid incidents with the United States, prior to the German declaration of war on December 11 the American Navy had no qualms about escorting British convoys as far east as Iceland and shadowing and later attacking on sight any U-boats they encountered. In this situation incidents, despite Hitler's orders, were bound to occur as the U-boats, when unable to shake their American pursuers, eventually began shooting back at their attackers. In September 1941 for instance the destroyer USS *Greer* was torpedoed by a U-boat that she had been tracking by sonar, while in the following month the USS *Kearny* and *Reuben James* were also torpedoed, the former vessel incurring casualties while the latter was sunk with all hands. If nothing else, at least now the U-boats would be able to shoot back at a foe that in their eyes was already shooting at them.

Operation Drumbeat: Attacks against the American East Coast

For Dönitz, the American entry into the war offered a unique opportunity to inflict a crushing blow on his new enemy. By his reasoning, submarine warfare conditions were at their best at the outset of a conflict, when enemy ASW measures were correspondingly at their weakest, but this was an advantage that would quickly erode as the new foe gained experience in anti-submarine warfare. Because of this, it was important that he immediately strike the American coast with a maximum concentration of force while conditions were still ripe.

Unfortunately, although the production figures were rising, the numbers of available U-boats were still low in relation to the requirements. Furthermore, as only the larger Type IX U-boats could carry sufficient fuel to operate in American waters, this “maximum concentration” did not amount to very much – only twelve boats by Dönitz’s reckoning. These boats he intended to concentrate at “focal points,” that is certain areas which were likely to see a convergence of merchant shipping, such as the entrances to major port cities or significant navigational landmarks that tended to funnel shipping through relatively narrow, easily patrolled, passages. The deployed boats were moreover to constantly change focal points after attacks, so as to always keep a step ahead of their pursuers. Unfortunately, due to requirements elsewhere that Hitler incorrectly deemed more important, most notable the Mediterranean theater, Dönitz’ total force had to be cut short by two boats, so that by the onset of hostilities only ten boats were making their way east – five for the US East Coast and another five to the tanker-rich area of Aruba-Trinidad-Curaçao.²⁶⁰

The five boats that arrived off the American coast on January 16 could not have asked for anything more than what they encountered. The conditions in American waters were still those

²⁶⁰ Newpower, 77

of a nation at peace. Ships still sailed individually and not in convoy, escorts were practically non-existent, and, most astonishing of all to the keen eyes of the U-boat crews, the lights of the cities continued to burn brightly into the night, a fact which allowed the U-boats to simply sit tight on the surface and shoot at the moving shapes of passing ships clearly silhouetted against the glow of the city. The result was a slaughter of epic proportions. Gannon for instance mentions 397 vessels being sunk in American waters during the first six months alone.²⁶¹ All in all, by the time the Second Happy Times came to an end in August 1942, a whopping total of 609 vessels for 3,122,456 tons would find their way to the bottom of the sea.²⁶²

Often ignored by historians amidst these dazzling figures is the sheer number of torpedoes used up by the U-boats in the course of these operations. Although premature detonations, errors in depth keeping, Pi failures, erratic runs, and other mechanical failures occasionally occurred, the main problem during this time was the large torpedo expenditure, even among those which functioned correctly, that was often required to sink even a single ship. This was a direct outcome of Dönitz' decision the previous May to abandon the MZ setting entirely and go over to the exclusive use of switch setting A. In the absence of an effective MZ setting, the U-boats had to use the less effective and far less powerful method of contact detonation. Moreover, the AZ's already limited destructive output was further reduced by continuing uncertainty surrounding reliable depth control. Because torpedoes had to be fired at a shallower depth than the ideal setting in order to ensure a hit, when the torpedo did run true, much of the warhead's blast would be re-directed to a less desirable spot, depriving the AZ of some of its destructive potential. Thus, instead of the ideal one shot one kill that theoretically should have been possible with a working magnetic detonation, commanders instead had to

²⁶¹ Gannon, *Operation Drumbeat*, 389

²⁶² Blair, 695

expend two, three, sometimes even four torpedoes just to sink a single ship. For instance, one study of 816 reported hits from the period of January-June 1942 showed that just forty percent of victims went down after one hit or more, thirty-eight percent required one or more additional torpedoes before sinking, while the remaining twenty-two percent got away after one or more hits.²⁶³ As the torpedo-carrying capacity of a U-boat, even of the bigger type IX's, was very limited, this severely restricted the success per boat. Nor was it simply an easy matter of returning home to stock up on new ones after the old had been expended, as home in this case was 3,000 miles away in France!

The entries under the seventh and eighth patrols in the war diary of the Type IX boat U-123, commanded by KptL Reinhard Hardegen and briefly summarized here, provide an excellent look into this problem of torpedo wastage. The account is made the more valuable by the fact that Hardegen was one of the most successful of the "Drumbeaters" that played such havoc off the American coast for the first half of 1942. In other words, if a captain with Hardegen's level of skill and expertise could be so affected by this problem, it would stand to reason that other, less skilled skippers would be equally if not more affected.

Like the rest of the "drumbeaters," Hardegen departed Lorient for the American coast on December 23. He arrived in his patrol area off New York Harbor on January 12, and quickly dispatched a steamer with two G7a torpedoes, both of which hit.²⁶⁴ Two days later, Hardegen scored another success on a big tanker off Narragansett Bay. Making use of the tanker's silhouette against the illuminated coast, Hardegen fired two torpedoes aimed at the tanker's aft bridge and mast. The first, presumably a deep runner, missed. The second struck the tanker exactly under the aft mast, detonating with a fifty meter high column of fire and dense black

²⁶³ Stern, 83 Dönitz, 94

²⁶⁴ Reinhard Hardegen, U-123 KTB, 12.1.1942, PG 30113/8, National Archives Microfilm Publication T1022 series, Roll 2973

smoke, but unfortunately the tanker remained afloat. Hardegen thus fired a third coup de grace shot (*Fangschuss*), which also hit, but still the stubborn vessel refused to sink. A fourth torpedo was a deep runner and missed. Finally the tanker went down after being hit by yet another torpedo.²⁶⁵ Thus, although Hardegen eventually sank this plump tanker, he expended five of his valuable torpedoes to do it. Hardegen's next two victims, a tanker sunk on the 15th and a freighter of 4,000 tons sunk on the 17th, were far more manageable, requiring an expenditure of only three torpedoes for the pair.²⁶⁶ By now Hardegen had only five torpedoes remaining, and so decided to cruise south towards the shipping lanes off Cape Hatteras, arriving the night of the 19th on calm seas, and, much to his excitement, right in the middle of two converging groups of unescorted merchantmen. Immediately Hardegen put two 4,000 ton freighters on the bottom using just two torpedoes, followed a few hours later by another pair which required three, plus a couple of shells from his deck gun. He would go on to sink a few more vessels with the deck gun, but by now he had exhausted his supply of torpedoes. He arrived back in Lorient on February 9. Before his torpedoes ran out, Hardegen had sunk about eight ships using a total of fifteen torpedoes, thirteen of which were hits, a ratio of roughly two torpedoes per ship.

This average would decline slightly during Hardegen's next patrol, his eighth of the war. U-123 departed Lorient on March 2, bound once again for Cape Hatteras, which he reached on May 22. At 14:47 hours he dispatched the 7,034 ton tanker *Muskogee* with just a single G7e torpedo.²⁶⁷ The next day he encountered the 8,150 ton tanker *Empire Steel*, which proved to be a far more difficult target, requiring a total of four torpedoes plus six rounds from the deck gun before she sank.²⁶⁸ On the 26th he expended two torpedoes on what appeared to be a 3,209 ton

²⁶⁵ Entry of January 14, 1942, *ibid.*

²⁶⁶ Entry of January 15-17, 1942, *ibid.*

²⁶⁷ Entry of March 22, 1942, *ibid.*

²⁶⁸ Entry of March 23, 1942, *ibid.*

freighter, but which actually turned out to be the U-boat trap USS *Carolyn* – a small warship disguised as a hapless freighter. Aside from recognizing the danger in time, Hardegen was also lucky to have only had to use two torpedoes, as most U-boat traps, because they were so lightly loaded in order to increase the ship's buoyancy as much as possible, required several torpedoes to sink.²⁶⁹ On the 29th and 31st of the month gyroscope malfunctions forced two torpedoes to detonate on the seabed, thereby warning the intended targets of U-123's presence and thus robbing Hardegen of any success.²⁷⁰ Success was again denied to him the next day as a result of what he believed were torpedo nets strung over the side of the 7,056 ton tanker *Liebre*, which combined with the events of the 29th and 31st accounted for three wasted torpedoes for no result.²⁷¹ In early April Hardegen was able to put his next three victims on the bottom with a single torpedo hit each, although during these days he also counted three failures, which resulted in at least two ships escaping.²⁷² Hardegen's last two torpedoes, which were fired on the 11th and 13th, were both hits, which sent their targets to the bottom after additional fire from the deck gun.²⁷³

All in all, Hardegen had bagged a total of eleven ships totaling 79,649 gross tons on this second patrol, although only eight had been sunk with torpedoes, the other three being the exclusive work of the deck gun. By any reckoning, it had been a very successful patrol, successful enough at any rate to earn Hardegen further decorations to his Knight's Cross. But nevertheless it had taken a total of eighteen torpedoes to sink just eight ships, an average of slightly over two per ship. This means that it would have been theoretically possible, assuming Hardegen possessed an MZ pistol that worked according to its prewar expectations, for him to

²⁶⁹ Entry of March 26, 1942, *ibid.*

²⁷⁰ Entry of March 29-31, *ibid.*

²⁷¹ Entry of April 1, 1942, *ibid.*

²⁷² Entry of April 7-9, 1942, *ibid.*

²⁷³ Entry of April 11-13, 1942, *ibid.*

have sunk twice the number of ships, and so roughly twice the tonnage. If one applies these increased percentages to the rest of the skippers and then totals up the new hypothetical tonnage figures for the Second Happy Times, the results would be staggering. What difference the increased figures would have made on the battle of the Atlantic as a whole is up to speculation.

Correcting the Depth Control Problem

Aside from the annoying inconvenience of being unable to use the MZ pistol, by far the most noteworthy occurrence of the 2nd Happy Time was the discovery of the last major defect in the standard German torpedo and the resulting perfection of the torpedo's depth-keeping device. Ironically, this discovery did not come from the technical minds at the TI, but was rather the accidental result of an unscheduled on-board inspection of torpedoes performed by one of the youngest skippers in the Kriegsmarine.

On January 31, 1942, U-94, a Type VIIC submarine, was on her way back to Germany after being forced to abort her patrol due to mechanical difficulties. On the return journey the boat's young skipper, twenty-three year old Otto Ites, decided to make an unscheduled thorough inspection of his boat's torpedoes. While ventilating one of the weapons, Ites noticed that a leaky seal allowed an unusual amount of air pressure to build up inside the torpedo's balance chamber in which the depth control mechanism was located. Finding this odd, Ites surfaced to report his findings to BdU. Coincidentally, this report was received by Dönitz at the very time that his staff was puzzling over the large number of torpedo failures recently reported by the first boats arriving off the North American coast.²⁷⁴ Upon receiving Ites' transmission, Dönitz quickly recognized the potentially negative implications this pressure build could have on the

²⁷⁴ Blair, 485

performance of the depth-keeping mechanism and immediately forbade the on-board ventilating and heating of G7e torpedoes.²⁷⁵

Understanding the effect of heightened air pressure on the depth control mechanism is a complicated matter, the core of which revolves around the relationship between the internal air pressure of the torpedo balance chamber versus the external water pressure of the sea outside. As Newpower explains, to understand the concept of depth a torpedo required a reference depth in the form of a constant value, which in our case was provided by the atmospheric pressure at sea level, which corresponded to zero feet. To this end the torpedo was equipped with a sealed container known as the “depth chamber” wherein this atmospheric pressure could be maintained at a constant value. The difference of the pressure inside the chamber to that outside corresponded to a relative pressure, or depth setting. As the difference rose and fell, the torpedo’s planes moved in the corresponding direction to maintain depth.²⁷⁶

The way in which the increased pressure could infiltrate and interrupt this arrangement is detailed by Heinz Trompelt, the former *Torpedo-Mechanikers-Maat* (torpedo mechanics mate) of U-172:

The steering mechanisms for the course and the depth were located at the rear of the torpedo, in a sealed-off compartment. Both control devices and a gimbal-mounted gyroscope were driven by compressed air. The depth control container on the torpedo protruded through a seal onto the control compartment (*Der Tiefenapparatbehälter durch eine Membrandichtung am Torpedo ragte in die Apparatkammer hinein*). The tetrahedral of the depth control spindle and the ventilating screw were located outside on top of the depth control container. Each time the torpedo was checked, the screw was adjusted in order to regulate the standard pressure in the container. At the bottom of the container was a rocker arm shaft which, together with the depth control mechanism, regulated the depth of the torpedo. For the designated depth there was a pre-tensioned spring, which regulated the air pressure and maintained the torpedo at the designated depth when it was fired. If the air pressure in the depth control container increased, the balance would be disturbed, and the torpedo would run deeper in order to re-establish the desired equilibrium by gaining increased water pressure. The compressed air that was

²⁷⁵ Dönitz, FdU/BdU KTB, 29.1.1942, PG 30303, National Archives Microfilm Publication T1022 series, Roll 3979, 42

²⁷⁶ Newpower, 53

used in powering the control mechanisms fed off into the control compartment, which meant that the air pressure tended to increase there. An exhaust valve was supposed to ensure that the increased pressure was released. Routine testing of this valve was not part of standard operating procedures. If excess air pressure seeped through the seal on the rocker arms into the depth control container, then the desired equilibrium would be disturbed and the torpedo would run deeper in order to equalize the increased air pressure by achieving increased water pressure.²⁷⁷

In and of itself this leak alone was not necessarily fatal to the torpedo. For example, if the torpedo was being ventilated in a zero pressure environment, such as in the open at sea level, the outside air pressure would not be sufficient to force its way through the seal and into the balance chamber. Inside the steel hull of a U-boat, however, the situation was completely different, as this was an environment in which the air pressure continuously changed. Frequent releases of compressed air while submerged were essential in order to maintain the boat's stability.²⁷⁸ High pressure air was also released into the boat as a side effect of firing torpedoes, and was used to power many of the boat's internal controls. In addition, air pressure was deliberately released into the boat in order to add oxygen to the boat's atmosphere when a period of prolonged submergence raised the CO and CO₂ to dangerous levels.²⁷⁹ Finally, in his KTB entry of November 20, 1939, KptL von Gossler mentions a very large buildup of air pressure inside the boat as a result of being depth-charged, indicating that this was another circumstance in which the pressure could rise.²⁸⁰ When the boat was forced to remain submerged for very long periods of time without surfacing, such as during operation *Weserübung*, these releases of compressed air eventually added up to a very high level of air pressure capable of penetrating into the balance chamber where it raised the atmospheric pressure which, in the way described

²⁷⁷ Heinz Trompelt, *Eine andere Sicht: Tatsachenbericht eines Torpedo-Obermech. Maat und Fähnrich z.S. Gefahren auf U-459 und U172* (Norderstedt, Herstellung und Verlag: Books on Demand GmbH, 2006), 148-149

²⁷⁸ Lawrence Patterson, *The First U-Boat Flotilla* (Annapolis, MD: Naval Institute Press, 2002), 46

²⁷⁹ Stern, 82

²⁸⁰ Kurt von Gossler, U-49 KTB, 20.11.1939, PG 30046, National Archives Microfilm Publication T-1022, Roll 3029

above, basically “tricked” the torpedo into thinking it was running shallower than it in fact was. The torpedo compensated for this by diving deeper to restore the pressure balance.

More than likely it was this increase in air pressure that was responsible for the failures that occupied the attention of Dönitz and his staff when they received Ites’ report of the 31st. As Trompelt points out, Operation Drumbeat was largely sustained by the efforts of the large Type XIV U-tankers, referred to as “milk cows,” that brought fuel and torpedoes from France to the boats in the operations area. These U-tankers were very large and clumsy boats, and the time they took to crash-dive (which in the event of an attack was more often than not the difference between life and death) was considerable. They were also of tremendous value to the Germans as their existence allowed BdU to prolong operations far longer than would otherwise be possible. Given these considerations, as much as possible of the outward journey was understandably made submerged. During the long outward journey, the torpedoes were likely to lie for long periods of time in storage under the floor plates of the U-tanker, where they were exposed to the aforementioned buildup of air pressure. Occasionally they would be taken out for the purposes of recharging the battery, but this did not include a comprehensive servicing or examination of the weapon along the lines of that performed by Ites. As such any buildup of air pressure in the balance chamber would remain undetected. As such, it is almost certain that several of the torpedoes delivered to the Drumbeat boats would have been defective.²⁸¹

With the discovery of this last major problem, the *Torpedokrise* had truly come to an end. As mentioned earlier, the actual “crisis” had come to an end some time earlier in June 1940 with the more or less permanent switch from MZ to AZ detonation and the start of the 1st Happy

²⁸¹ Trompelt, 150-151

Times.²⁸² But it is still worth remembering that it was not until Ites' discovery of the final depth problem in late January 1942 that the Germans at last possessed a torpedo that was truly reliable in all of its major parts (propulsion, guidance, warhead, pistol, depth-keeping).

Torpedo development did not stop here of course; the Germans would go on to produce newer torpedo models such as the T3, T4 (Falke) and T5 (*Zaunkönig*/Wren) acoustic homing torpedoes, or the FAT and LUT pattern running devices which could be affixed to existing torpedo variants. The problem with the MZ was finally solved in late 1942 with the introduction of the Pi2 pistol, an improved version of the Pi1 that drew its power directly from the G7e's own battery. The pistol was tried out first in the Mediterranean in November 1942 and in the Atlantic that December. The initial results were quite poor as the Germans at first set the running depth of the torpedo too shallow in an effort to limit the effect of possible MZ failures. By April 1943 this had been remedied by increasing the depth setting, which resulted in a great improvement. From this point on, the Pi2 became the standard pistol on all new G7e torpedoes.²⁸³

All these improvements however were too little too late. With the collapse of the U-boat war in May 1943, – the infamous “black May” – the great race that the Germans had unknowingly been running against time, of scoring a final victory before the Allied technological advantage became decisive, had been lost. Their window of opportunity had been irreversibly closed. Was this a race that the Germans had even had a chance of winning in the first place? The Germans at the time certainly thought so, even if opinion among historians today is divided. The answer to this question, if one truly does exist, lies outside the scope of this study. My purpose here is not to argue whether the Germans did or did not have a reasonable shot at winning the Battle of the Atlantic, but rather to show that whatever shot they did have was

²⁸² I say “more or less permanent” because the MZ would in fact make another appearance some years later in November 1942.

²⁸³ Stern, 83-84

dependent, among other things, on solving their torpedo problems within a rapidly closing window of opportunity, and more importantly of doing so quickly enough to allow enough time afterwards of achieving a decisive victory before this window closed. In this the Germans were unsuccessful.

But why and how did this first step ever come about in the first place? What factors accounted for the atrocious state of the German torpedo at the beginning of the war, and who was to blame for it? The next section will attempt to answer this question.

Chapter 7

Explaining the Torpedo Crisis: Analysis of Contributing Factors

In conjunction with a number of institutional and outside factors, the poor state of the torpedo, pistol, and depth control in September 1939 was the direct result of a long series of blunders, poor management, and in certain cases outright neglect of crucial areas of torpedo development by key persons within the *Torpedowaffe* during the inter-war years. This next section will trace the course of these blunders as well as analyze some of these negative influences in an attempt to weigh how each contributed to the poor state of the *Torpedowaffe* at the beginning of the Second World War.

Prewar Depth and Pistol Testing

One of the most frustrating pieces of news learned by Dönitz during the depths of the *Torpedokrise* in May 1940 was the revelation that several of the current problems, particularly the faulty depth-keeping device, had actually been known of years before the war started, as far back as December 1936 and June 1937 after a series of *Netzschiessen* conducted by the TVA in Eckernförde. The *Netzschiessen* (literally net shot) was a simple enough method of determining the actual running depth of a torpedo, consisting as it did of firing a torpedo with a dummy warhead into a suspended vertical net that marked the water's depth in meters. From here it was a simple matter of determining the difference between the torpedo's set depth, and the actual point at which it struck the net. At the *Netzschiessen* in December 1936 it was shown that a G7a

torpedo with a set depth of four meters actually ran 2.5 meters deeper than set, at 6.5 meters,²⁸⁴ while the G7e torpedo ran deeper still, at 2.75 meters.²⁸⁵ In June 1937 an additional *Netzschieszen* of sixty-eight shots took place at which torpedoes fired at extreme ranges were shown to run one meter deeper than set, while those fired at short range ran 1.8 meters deeper.²⁸⁶

This variance was supposed to be remedied by the installation of a new depth spring (*Tiefenfeder*) in the TA, which was approved on July 16. A follow-up test firing of forty-nine shots seemed to confirm the reliability of the new depth spring, although it should be mentioned that the torpedoes used here were not of the standard series issue, but rather were experimental types.²⁸⁷ Although Naval Chief Engineer Mohr, who was in charge of the shoot, deemed that further testing was necessary, his concerns were overridden by the then chief of the TVA, Rear Admiral Oskar Wehr, who proposed at a July meeting of TI officials that the new depth spring be immediately introduced for the entire fleet. This suggestion was approved, and the installation of the new depth spring was given a label of “top priority,” although due to some oversight this designation was changed on the official orders to “when possible.”²⁸⁸ Without this priority status, and in the face of more urgent matters, such as the development of the MZ as well as several additional types of torpedoes aside from the standard G7a and G7e, work which ultimately came to nothing, the matter of the depth spring was shelved and allowed to lag.²⁸⁹ In addition, with the coming into service of the magnetic detonator, matters of depth control were no longer thought as important as they once were. In any event, it was not until January 1939 that torpedoes incorporating the new depth spring finally started to become available.

²⁸⁴ Rössler, *Die Torpedos der deutschen U-Boote*, 60; Bekker 133; Kurowski 368;

²⁸⁵ Rössler, *Die Torpedos der deutschen U-Boote*, 68

²⁸⁶ *Ibid.*, 60

²⁸⁷ *Ibid.*, 60

²⁸⁸ Bekker, 134

²⁸⁹ Rössler, *The U-Boat: The evolution and technical history of German Submarines*, 143. The experimental torpedo types were the G7a6 and G6a.

In the meantime, pending the installation of the new TA spring, testing continued to be done that not surprisingly revealed flaws with depth control. In October 1938, for instance, the destroyer *Richard Beitzen* conducted some unsatisfactory firing trials from the TVA's range in Eckernförde. Regarding these trials, the destroyer's skipper, Lieutenant-Commander Moritz Schmidt, wrote in his report that "Most torpedoes ran erratically as to depth . . . variations up to four meters . . . enough to shake one's faith in the weapon." Yet although they received a copy of the report, the TVA inexplicably failed to pass its contents on to its superior agency, the TI, with the result that the Torpedo Inspector remained in complete ignorance of the matter.²⁹⁰ Likewise, in a summary of the 1938 Fleet torpedo trials, the Fleet Command reported a number of surface runners and GA failures, as well as "many ballistic failures and engine disturbances, that urgently need remedying." However, perhaps in view of the imminent arrival of the new depth spring, the report went on to say that "the TVA has recognized these GA and depth-keeping shortcomings, and has guaranteed their removal on all newly produced torpedoes."²⁹¹ Had the subject of depth-keeping in general occupied a higher place in terms of priority, and had the TVA been more responsible about reporting its findings, any one of these tests should have been sufficient to accelerate the installation of the new spring.

The one year and five month period of delay from the time the decision was made to incorporate the new depth spring in all new torpedoes until it was actually carried out particularly hurt the Navy by depriving it of valuable time in which to familiarize itself with the new TA and to possibly expose any as yet unidentified failures. As it was, it was not until a further TVA *Netzschieszen* in May 1939 revealed significant depth problems that anyone had any idea that the new depth spring was not entirely reliable. At the time of this testing Admiral

²⁹⁰ Bekker, 135

²⁹¹ "Entscheidung des Flottenchefs zum Flottentorpedoschießen 1939," PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

Wehr was on extended vacation leave after suffering earlier in the year what was basically a nervous breakdown occasioned by the stress of his position, and so the report went to his deputy, *Korvettenkapitän* Frerichs, who instead of forwarding the information to the TI, put it in a memo which he left for Wehr. However, in what must certainly be viewed as an act of negligence (which as will be seen was not altogether uncommon for him), after returning home from vacation on June 20, Wehr also failed to pass the report onto the TI. His reasons for doing so will be further elaborated upon in a later section assessing culpability. Consequently, it was not until reports of depth keeping problems began to arrive from the front that the Torpedo Inspectorate had any idea whatsoever that a problem with depth even existed, despite the fact that the problem was known by several persons in its subordinate agencies.²⁹²

While the origins of the depth problem during the inter-war years were largely that of a system that was properly tested, found to be faulty, and then basically ignored, the story of the Pi problems was quite the opposite, being a system that was never properly tested to begin with. The impact pistol was approved for service in 1928 after a mere two test shots at a suspended plate, neither of which were entirely successful. Neither torpedo actually hit the plate surface; it merely glanced off an attached beam. Nor was the actual angle of impact accurately determined (specifications were for a guaranteed detonation at twenty-one degree angle of impact), but since both torpedoes did in fact detonate, the test was deemed a “success.” Further limited testing came in the autumn of 1938, when on the grounds of earlier impact tests suspicions arose as to the reliability of the impact detonation angle. These tests revealed that failures with the impact pistol occurred with a thirty-five degree of heeling (the lean of the torpedo during its run to any

²⁹² Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, “M. hielten sein Vetreter und Wehr . . .,” Anlage v, 17.9.1940, PG 31057, Band II, seite 273-275, National Archives Microfilm Publication T1022, Roll 3467

one side), which led to the approval of another two plate shots (*Plattenschüsse*) with the Pi G7a pistol. The results for these tests were likewise poor, showing that the torpedo would only detonate on a twenty-one degree angle of impact if the heeling of the torpedo was not more than five degrees, while with ten degree heeling impact was only assured at an impact angle of more than fifty degrees. These discoveries led to some minor improvements, such as the addition of a steel tip to the torpedo's gripping nose, which authorities saw as being responsible for the failures (*die Folge einer ungeeigneten Greifnase ware, und schlug die Anbringung von Stahlspitzen bei ihr vor*). These changes moreover were not even tested beforehand, but were rather simply "approved."²⁹³ Like the TVA's earlier indifference to the state of the depth-keeping mechanism, this was a direct result of the prewar Navy's infatuation with the new magnetic detonator, which was seen as the answer to all problems.

Given the Navy's enthusiasm for the MZ pistol, which indirectly led to the neglect of several other crucial programs such as the AZ and depth-keeping, one might have expected the Torpedo authorities to adapt a commensurately rigid system of proving trials. Instead the result was a pathetic series of tests, the criteria of which did not even include a single live firing exercise of the MZ against target ships in the open sea.²⁹⁴ Instead, as Admiral Wehr describes, "each pistol was shot through a strong magnetic field and only came to the Naval yards when it was proved that the MZ reacted to this strong magnetic field"²⁹⁵ However, as by now should be exceedingly obvious, simply reacting to a magnetic field by itself is not enough to ensure a successful detonation. The pistol had to react with the appropriate amount of sensitivity, as reacting with too much sensitivity would cause it to detonate well before the ship, while reacting

²⁹³ Rössler, *Die Torpedos der deutschen U-Boote*, 76

²⁹⁴ Newpower, 35

²⁹⁵ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, "Scharfe Schüsse," Anlage k, PG 31057, Band II, seite 153, National Archives Microfilm Publication T1022, Roll 3467

with too little would not cause a detonation at all. Simply proving that the MZ reacted without knowing the extent accomplished nothing. The only way to determine the extent of this reaction was by a large number of *Scharfe Schusse* (an armed shot with a live warhead) against a couple of old metallic ships in the Atlantic. This was not done. In testimony delivered at his court-martial, Dr. Schreiber, one of the key technicians who worked on the MZ, referred to a one time test using two armed shots conducted against the old ships *Niobe* and *Weserland*, which did in fact work, but this was done by the technical staff in an extremely controlled setting. This was a far cry from what Dr. Schreiber claimed he had repeatedly urged, which was for live military testing done in the open sea where the effects of the magnetic influence on the torpedoes behavior could be better observed.²⁹⁶ Moreover, as Admiral Wehr claimed, the purpose of the *Niobe* and *Weserland* shootings was not so much to prove the functioning of the MZ pistol but rather to “illustrate how strong the effect of a warhead detonated magnetically (detonation under the target) actually is.”²⁹⁷

Influence of the Spanish Civil War

In truth, the December and June *Netzschissen*, in addition to the other testing that went on during this time, were probably not necessary to establish that something was severely wrong with the torpedoes. Ample proof of the torpedo’s deficiencies came from the disastrous performance of German U-boats sent to aid the Nationalist forces during the Spanish Civil War. Reports coming back from the Spanish front said in particular that the torpedoes were

²⁹⁶ Ibid., “Begriff: Militär. Erprobung – techn. Erprobung,” Anlage b, PG 31057, Band II, seite 124, National Archives Microfilm Publication T1022, Roll 3467

²⁹⁷ Ibid., “Scharfe Schüsse,” Anlage k, PG 31057, Band II, seite 153, National Archives Microfilm Publication T1022, Roll 3467

“mechanically defective, failed to run straight or at a predictable depth, and at the end of their run were prone to sink.”²⁹⁸

In response the Torpedo Inspectorate conducted a complete overhaul of German torpedo stocks. A document dated October 21, 1936, roughly three months after the outbreak of hostilities in Spain, states that “Varieties in the recent appearance of failures makes necessary the intensive peace-time testing of the entire torpedo store under wartime conditions. Only through such testing can possible causes of failure be recognized and removed.” In order to determine the true extent of the torpedo’s deficiencies and improve their overall reliability a series of measures were prescribed. Noteworthy among these was the setting up of a two week period each year during which time every ship in the fleet would service and ensure the readiness of its torpedoes by testing ten percent of its torpedo arsenal, although it is worth pointing out that this did not include any live-firing drills. Torpedoes were instead to be equipped with a dummy practice warhead during firing drills. In addition for four weeks each year all combat-cleared torpedoes were to be carefully regulated according to the established provisions by one battleship, one aircraft carrier, two cruisers, one destroyer division, and one torpedo boat, S-boat, and U-boat flotilla. The same was to be done by all air services employing torpedoes. Finally, all torpedoes stored at dockyards and other arsenals were to be carefully investigated.²⁹⁹

On the technical front, the TVA was ordered to commence testing of all newly produced G7a and G7e torpedoes at each of the three different speed setting. In particular the TVA was to determine the percentage of shots that did or did not exhibit any failures or deficiencies, and how many of the deficiencies that might arise could be corrected by ships or U-boats by on-board means, as well as whether the prescribed speed setting were safe. The TVA was even ordered to

²⁹⁸ Bekker, 134

²⁹⁹ “Torpedoinspektion Abschrift Betrifft: Kriegsmäßige Beanspruchung der Torpedoarmierung,” B. Nr. G 7080TT, 21.10.1936, PG 34427/75, National Archives Microfilm Publication T1022, Roll 3895

conduct tests in different temperatures to determine whether the temperature of a torpedo at time of firing could influence its behavior.³⁰⁰

The fleet commander confirmed acceptance of these suggestions twelve days later in a follow-up memo, with the added suggestion that additional data might be gained and things be expedited if the boats already present in Spain would perform this maintenance work on site in Spanish waters rather than returning home first. In addition the fleet commander asked the commander of the Spanish task force to look into the possibility of holding additional torpedo shootings of vessels currently in Spain immediately after their return.³⁰¹

According to the testimony of Admiral Scherf, the above mentioned trials were carried out in the TVA shooting range at Eckernförde by the torpedo boat *Albatross*, and the results were passed on to the TEK for review. Finding the results unsatisfactory, the TEK urged the TI to conduct another shooting series, again using torpedoes taken from ships on their return from Spain. After determining this second series to be unsatisfactory, the OKM ordered yet a third series to be conducted by the TEK under the most stringent conditions possible.³⁰² This was done in February 1938 using twenty-seven torpedoes brought back from Spain. The results were appalling; Seventy-four percent of shots fired were recorded as failures (48 percent engine failures, 7.4 percent GA [*Geradelaufapparat*] failures, 18.6 percent TA [*Tiefenapparat*] failures).³⁰³ It should be pointed out, however, that during these tests little attention was paid to exact depth-keeping, which according to Admiral Scherf was in any event not possible in the absence of a proper *Netzschieszen*. Moreover, depth was determined by the depth-registration

³⁰⁰ Ibid.

³⁰¹ "Flottenkommando Abschrift Betrifft: Kriegsmäßige Beanspruchung der Torpedoarmierung," B. Nr. 5235 A3, 2.11.1936, PG 34427/75, National Archives Microfilm Publication T1022, Roll 3895

³⁰² Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, "Albatross-Schieszen Schlechte Tiefenhaltung mit alter Tiefenfeder erklärt," Anlage L, PG 31057, Band III, seite 52, National Archives Microfilm Publication T1022, Roll 3467

³⁰³ Rössler, *Die Torpedos der deutschen U-Boote*, 61

pistol (*Tiefenregistrierpistole*), which did not function correctly at the torpedo's top speed, which was the setting used in the trials.³⁰⁴ In any event, it is exceedingly unlikely that any attention would have been paid to matters of depth control as a result of the *Albatross* shootings. Even had the depth registration pistol functioned correctly, any negative results shown would likely have been dismissed as being of no consequence as they theoretically would have been negated by the pending introduction of the new depth spring. At any rate, follow-up conferences taking place on April 26 and August 26 were concerned exclusively with matters of engine performance, speed, and the *Geradelaufapparat*. Depth figured into them not at all.³⁰⁵

The results of the *Albatross* shootings were hotly contested by Admiral Wehr, who later described them as being carried out under “impossible conditions” that “led the torpedoes to ruin.” In addition, he accused the *Albatross* report of “disastrously affecting the front, *as it conveyed the impression that the torpedoes were entirely unreliable!*”³⁰⁶ While Wehr's initial criticism – that anything can be made to fail if the proper conditions and methods are employed – is certainly legitimate, his second sounds nothing short of ludicrous in that the entire purpose of military testing is after all to accurately evaluate something in an effort to determine how it can be improved. It is not to bolster men's morale. Part of these criticisms can be attributed to Wehr's personal antipathy to the TEK, which did not even exist at the time of his appointment as head of the TVA. At the time, all developing, testing, and determination of a torpedo's reliability was the exclusive concern of the TVA, and he viewed the creation of the TEK in 1937 as a direct infringement on the TVA's territory. At the same time, however, Wehr is remarkably

³⁰⁴ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, “Albatroß-Schiessen kein Prüfen Tiefenlauf . . .,” Anlage a, PG 31057, Band IV, seite 11-11R, National Archives Microfilm Publication T1022, Roll 3467

³⁰⁵ Ibid., “Sitzung 26.4.38 Anweisungen des Inspektors sehr deutlich,” Anlage c, PG 31057, Band IV, seite 12-12R, National Archives Microfilm Publication T1022, Roll 3467

³⁰⁶ Ibid., “Bezug Albatroß-Schiessen,” Anlage i, PG 31057, Band IV, seite 25, National Archives Microfilm Publication T1022, Roll 3467 [emphasis added]

consistent during his tenure as head of the TVA in criticizing anything that in his opinion undermined faith in the torpedo, which would indicate that he was actually sincere in these beliefs. In any event, his criticisms notwithstanding, the *Albatross* shootings have to be seen as having made a considerable impact, as most of the problems addressed in the follow up conferences had been significantly improved during the war.

In the long run, however, the terrible performance of German torpedoes during the Spanish operations has to be seen as an incredibly positive occurrence in the development of the German torpedo arm. It was only because of this participation, which gave the *U-Bootwaffe* some valuable first hand experience in shooting torpedoes under combat conditions before their ultimate test during the Second World War, that the Germans were able to discover just how defective their torpedoes actually were and thus take measures, such as additional testing, to correct some of these shortcomings. Even though most of these changes were regrettably made in areas other than what would be the major points of concern during the war (depth-keeping and pistol failures), it is safe to say that without this experience the state of the German *Torpedowaffe* at the outbreak of the World War a few years later would have been even worse than it actually was.

Efforts of TI to uncover failures in prewar years

In assessing the factors that led to the *Torpedokrise*, it is tempting to view the whole matter as being a direct consequence of the seeming lack of attention paid by the Fleet and the Torpedo Inspectorate and its subsidiary organs to the presence of torpedo failures and malfunctions in the years preceding the war. This view is deceiving. In fact, the evidence points

to quite the opposite conclusion, namely that the Fleet and the Torpedo Inspectorate were actually quite diligent in their efforts to catalogue torpedo malfunctions, uncover their causes, and provide the fleet with a working reliable weapon.

For instance, in terms of testing, the Torpedo Service Instruction Manual for the year 1937 specified that the reliability of each torpedo was to be confirmed through testing if the torpedo had not been fired in five months (for G7a) or seven months (for G7v) and also after certain types of maintenance work had been performed.³⁰⁷ All dockyards and arsenals were also required by order of the *Führer der Torpedoboote* to carefully test each torpedo before its delivery to the front.³⁰⁸

To gain a better understanding of the types of malfunctions most likely to appear in a torpedo attack, in 1938 the TEK prepared a detailed questionnaire for surface ships that was to be filled out and reported after each exercise. As regards torpedoes, the questionnaire inquired after the side to side motion of torpedoes during their run, the presence of surface runners, whether the transmitters and lights on the practice warhead functioned correctly, whether any failures were observed and if so, whether arrangements had been made with the TVA for their investigation, and whether the air remaining in the torpedo's boiler chamber after the shot corresponded with the values on given tables.³⁰⁹ This questionnaire was soon followed by an attachment asking a number of additional questions such as whether there were any cold-runners (*Kaltläufer*) in the shooting exercise, what percent of the total they were, whether the causes for them were established, and whether any of the torpedoes that initially malfunctioned were shot

³⁰⁷ "Kurzbrief Betrifft: Änderung der Bestimmungen über Prüfungsschiessen der Torepdos," 9.6.1937, PG 34427/75, National Archive Microfilm Publication T1022, Roll 3895

³⁰⁸ "Führer der Torpedoboote Abschrift Betrifft: Änderung der Bestimmungen über Prüfungsschießen der Torpedoes," B. Nr. G 1286 A1, 4.6.1937, PG 34427/75, National Archives Microfilm Publication T1022, Roll 3895

³⁰⁹ "T.E.K. Fragebogen 1938 für Überwasserstreitkräfte," Anlage zu T.E.K. G 1159/38, PG 34427/75, National Archives Microfilm Publication T1022, Roll 3895, 135-136

again and what the results of the new shooting were.³¹⁰ Although the TEK questionnaire did in fact yield much useful information, it was only temporary in its duration, and in July 1939 the questionnaire was withdrawn on the grounds that sufficient data had been acquired.³¹¹ Although in cancelling the questionnaire the TEK deprived itself of a valuable tool for gathering further information, by the time of its expiration the *Fragebogen* had likely already accomplished all it was capable of as war would break out just one month later.

Much like the TEK *Fragebogen*, on October 10, 1938, the TI issued its own set of guidelines to the fleet outlining how they should proceed in reporting torpedo failures. The guidelines began by stating that “The number of failures with the G7a torpedo has in the past year declined seven percent,” and that “through the introduction of constructive improvements in the course of the next months a further decline of these numbers is to be expected.” However, despite this reduction in number, “since certain causes of failures are not yet entirely clear and furthermore the results of certain shooting sections are substantially lower than the average result, the TI orders that until further notice [the Fleet] is to proceed with arising failures in accordance with the following guidelines.”³¹² Following the conclusion of any shooting section or exercise the total number of shots and any occurring failures and their type were to be immediately sent together with the prescribed failure registration form to the TI, the TVA, and the TEK. At the same time it was to be reported at what time and by which agency these failures were to be investigated. To be included with the formal written report was an oral account of the failures given by the agency/group on whose watch the failures occurred. It was especially

³¹⁰ “Torpedoepröbungs-kommando Abschrift Betrifft: T.E.K. Fragebogen 1938 für Überwasserstreitkräfte,” B. Nr. G 1753, 17.10.138, PG 34427/75, National Archives Microfilm Publication T1022, Roll 3895, 198-199

³¹¹ “Torpedoepröbungs-kommando Abschrift Betrifft: T.E.K. Fragebogen 1938 für Überwasserstreitkräfte,” B. Nr. G 2046, 28.7.1939, PG 34427/75, National Archives Microfilm Publication T1022, Roll 3895, 213-214

³¹² “Torpedoinspektion Abschrift,” B. Nr. G 5170T, 10.10.1938, PG 34427/75, National Archives Microfilm Publication T1022, Roll 3895, 203

desired that this oral report contain any mention of incidents in which the failure percentage was abnormally high, and whether any certain type of failure predominated. However, like the TEK *Fragebogen*, the TI guidelines came with an expiration date of April 1, 1939, at which point these rules no longer applied.³¹³ Unlike the TEK *Fragebogen* this early expiration date likely proved particularly harmful, as by it the TI was deprived of several months of results, from the time of the expiration to the first reports of torpedo failures immediately after the outbreak of war. Moreover, these guidelines expired before the introduction of the new depth spring. Had they still be in place, it is possible that the TI would have learned of the lingering depth control problems with the new depth spring before the outbreak of war, and thus in a position to remedy this defect at an earlier date. As it is, the early termination of these questionnaires suggests a failure on the part the torpedo authorities to recognize the necessity of continued periodic testing over the entire life span of the weapon.

Faulty method of conducting torpedo trials

The real problem with the Navy, the TI, the TVA, and the TEK, at least as pertains to trials and testing, was not their lack of effort but rather their method. In short, torpedo trials and testing were done in such a way that it was not possible to detect the types of problems (pistol problems and depth control) that later plagued the *U-Bootwaffe* during the first half of war. By and large, torpedo trials and testing suffered from two main problems: 1). The conditions during trial shootings differed drastically from combat conditions at the front, and 2). Live firing exercises were not permitted during trials. In addition to this, it is my contention that the Navy's

³¹³ *Ibid.*, 204

own evaluative standards were not nearly rigid enough, which set a bad precedent for the later performance of torpedoes in combat.

Before getting into the details of these deficiencies, it is worth taking a minute to say a few words about the setup of torpedo trials, which can initially be quite confusing. Outside of separate trials done by the Navy and by individual testing by separate U-boats, there were two main types of testing: technical tests and military tests. Technical tests were conducted by the technicians of the agency responsible for the actual testing after the device in question was fully developed. Normally this would mean the TVA, but could also apply to the TEK. Upon completion of this testing, the technicians would send a report of the test to the military advisor (*Referenten*) attached to the agency, which would sign it and pass it on to his superiors, who then decided from the evidence presented whether further military testing was required. The technical personnel responsible for the initial testing would have no idea what this decision would be. If it was decided to go ahead with the military testing, and assuming that failures or other irregularities were again present, a meeting of technical and military representatives would take place at which point the technical staff would be informed of what was wrong, and what was expected of them, at which point the matter would go back to the technical staff and the process would repeat itself.³¹⁴

On November 2, 1938, a set of guidelines for a pending *Torpedoprüfungsschiessen* (torpedo proofing testing) was issued. Although the bulk of the information is of marginal interest, one particular sentence stands out: “After a basic proofing of the torpedo fire control

³¹⁴ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, “Begriff: Militär. Erprobung – techn. Erprobung,” Anlage b, PG 31057, Band II, seite 124-126, National Archives Microfilm Publication T1022, Roll 3467

systems the shooting trials are to take place under the simplest conditions possible . . .”³¹⁵

Although it refers only to this one specific test, this sentence is nevertheless illustrative of the first major weakness of torpedo tests and trials, namely that the conditions during testing differed dramatically from those at the front. Dönitz himself acknowledged the drawbacks of current testing methods when, writing in his KTB on February 23, 1942, he mentioned that the discovery at sea by U-94 of the last remaining depth problem proved “how difficult it is despite complicated tests to discover the causes of failures, as it is almost impossible to re-construct actual operational conditions at such trials.”³¹⁶

The main weakness of course in this approach to conducting tests is that it is relatively easy to predict the behavior of something in a controlled environment because there is nothing left to chance. For example, we have seen earlier how disturbances in the water could cause a certain degree of heeling in the torpedo run, which if great enough, would negate the torpedo’s working angle of impact. Obviously the stormy seas of the North Atlantic would cause the torpedo to heel to a much greater degree than the calm and smooth water inside Eckernförde, so that testing done entirely in Eckernförde would be much less likely to expose this problem than tests conducted in the Atlantic. In addition, aside from the natural surroundings, tests done at home always had the advantage of having a large staff of trained experts on hand to meticulously check and recheck every contributing system, so that in a test conducted on April 2, 1938, for instance, a pretest of the fire control system was performed before the actual torpedo test to ensure that everything worked perfectly during the actual test.³¹⁷ During his court martial hearing Admiral Wehr was actually told by the court that the testing conditions at the range were

³¹⁵ “Richtlinien über Durchführung von Torpedoschießübungen der Zerstörer, Torpedo- und Schnellboote,” PG 34427/75, National Archives Microfilm Publication T1022, Roll 3895, 207

³¹⁶ FdU/BdU KTB, 23.2.42, PG 30304b, Roll 3979, 93

³¹⁷ “Torpedoepröbungs-kommando Abschrift Betrifft: T.E.K.-Eprobungen Z 5-8,” B. Nr. G 533, 2.4.1938, PG 34427/75, National Archives Microfilm Publication T1022, Roll 3895, 177

not suitable to uncovering problems with the pistol and depth and was asked whether it ever occurred to him to change the conditions accordingly. Wehr never really answered this question fully, except to say that the pistol had already been approved for use before his appointment to the TVA and that under his watch they were all tested according to regulations, which not surprisingly failed to turn up any mistakes. He did state that he thought it “absolutely necessary” that the pistol be tested in high seas, but this of course does not answer why he failed to do so.³¹⁸

The most damaging aspect in the arrangement of torpedo trials, especially as concerns the development of the magnetic exploder, was the Navy’s aversion to conducting these trials using live warheads. This aversion stemmed from the Navy’s reluctance to lose torpedoes. The torpedo was a valuable item, costing according to Trompelt 30,434 RM apiece, and 700,000 RM for a full load of 23 carried on board a type IXC boat.³¹⁹ Each torpedo fired with a live warhead, assuming it functioned correctly, was one that was permanently lost to the Fleet. To conserve their precious stock of torpedoes the Navy simply recycled everything it used. Before it was fired, the torpedo’s warhead was removed and replaced with a dummy practice warhead of the same weight, on the tip of which was installed a bright floodlight. The dummy warhead was built to the same specifications (weight, diameter, etc) as the actual warhead, so there would be no difference in performance. The light on the tip allowed observers to track the torpedo’s path. The torpedo would be lined up and fired at a floating target, and a hit would be determined by observing the light pass harmlessly underneath. At the end of its run the torpedo would come to rest in an upright position with the tip of the dummy warhead floating above the water’s surface. When all torpedoes had been fired, a waiting flotilla of recovery boats would make their way to

³¹⁸ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, “Wehr hielt Hochseeschießen für erforderlich,” Anlage m, PG 31057, Band IV, seite 29-30, National Archives Microfilm Publication T1022, Roll 3467

³¹⁹ Trompelt, 161

where the torpedoes' runs had ended, fish them out of the water, and take them to servicing stations where they would be made ready to be used again.³²⁰

Although this method had the advantages of conserving torpedoes and allowing observers to notice any GA malfunctions or aberrant behavior during the run, it conveyed nothing about the torpedo's running depth and ability to detonate once it struck the target. As mentioned before, this was considered to have already been proven, in the case of the AZ by the two partially successful live shots fired against the suspended plate, and for the MZ by observing the reaction of each new pistol when shot through a strong magnetic field. The drawbacks of this approach did not go unnoticed. Dr. Schreiber, for instance, stated that he repeatedly urged the military to undertake at least a couple of armed shots in the Atlantic but to no avail.³²¹ Dr. Cornelius also later testified at the court martial proceedings that his and others' research and development work during the prewar years was severely hampered by the complete absence of any comprehensive system of military testing using armed live fire exercises, which he said prevented him from uncovering the wartime problems with the pistol and depth-keeping.³²²

Lax standards by the Navy in assessing results of torpedo trials

In the grand scheme of things, everything that the Navy and technical departments knew about torpedo performance and behavior came from the observed results of shots fired both in combat and in individual and large scale shooting exercises (known as sections). Given the

³²⁰ Trompelt, 34

³²¹ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, "Begriff: Militär. Erprobung – techn. Erprobung," Anlage b, PG 31057, Band II, seite 124-126, National Archives Microfilm Publication T1022, Roll 3467

³²² Ibid., "Scharfe Schüsse haben immerhin Wert von Stichproben," Anlage g, PG 31057, Band III, seite 29-29R, National Archives Microfilm Publication T1022, Roll 3467

apparent importance of such reports for the further development and improvement of the *Torpedowaffe* it would seem natural to believe that the Navy would demand from these tests the highest possible degree of accuracy and performance. But at least in regards to performance, however, several tests would seem to indicate a certain level of complacency within the Navy and willingness to tolerate sub-standard results.

For example, the “thoroughly satisfying” results of the 1st Torpedo Shooting Section of the 1938 fleet torpedo trials, as described by the commander of the 2nd Destroyer Division, serves to illustrate the above-mentioned point. This shoot was carried out over July 25 and 26, 1938, by the three destroyers *Hermann Shoemann*, *Paul Jacobi*, and *Bruno Heinemann*, which fired a total of thirty-eight, fifty-four, and thirty shots respectively. *Hermann Shoemann* and *Paul Jacobi*, which are described as having excellent and fully trained crews, managed hit rates of 65 percent and 63.9 percent, while *Bruno Heinemann*, the crew of which was apparently very green, managed only 35 percent. Torpedo failures (those that could actually be observed) were described as nearly zero for both of the first two ships, and about 13 percent for *Bruno Heinemann*.³²³ Of course, this still means that even the two most successful destroyers missed 35 percent and 36.1 percent of the time in a controlled setting and calm seas.

An even better example is found in the report of the Admiral for Norway concerning the results of trials from seven different shore based torpedo batteries from April 27 to May 21, 1941, the “hit results” of which are likewise described as “satisfying.”³²⁴ Of the total of seventy-one shots fired from the seven batteries, thirty-three of these (46.4 percent) were categorized hits. Twelve of these (16.9 percent) were categorized misses. For nine (12.7 percent) the results were

³²³ “Bericht des Chefs der 2 Zerstörerdivision über den I. Schießabschnitt 1937/38 (Flottentorpedoschießen 1938),” PG 34427/75, National Archives Microfilm Publication T1022, Roll 3895, 157-169

³²⁴ “Der Leiter der Torpedoausbildungsstelle in Norwegen,” B. Nr. G 20, 10.6.1941, PG 47375, National Archives Microfilm Publication T1022, Roll 2778, 98

not noticed. Seven of these (9.9 percent) were failures, while four of them (5.6 percent) failed to run. Three of these (4 percent) were surface runners, two of them (2.5 percent) ran into the ground, and one (1.4 percent) was a circle runner. The most glaring statistic of course is that only 46.4 percent of the torpedoes fired hit their target while 53.6 percent did not, despite being fired in the controlled setting of a testing establishment.³²⁵

These examples raise the question of what exactly the German definition of success, or “satisfaction,” was? It is difficult to imagine a person like Dönitz being “satisfied” when 53.6 percent of a U-boat’s torpedoes missed. The same could probably be said of everyone else in BdU headquarters and in the *Kriegsmarine* as a whole. But it is also true that great success rarely comes to someone – or in this case a weapons branch – which is “satisfied” with a mediocre performance. Furthermore, there is usually some level of drop-off between a torpedo’s performance under combat conditions versus its performance in the range. In this case, according to Rössler, the average hit rate of torpedoes fired from September 1939-April 1940, and June – December 1940, was roughly 48 percent. It is certainly interesting how closely this average of misses in combat corresponds to the training average, which for the second example is actually lower! The underlying point is that if the results of these two trials and the attitude of German naval officials present at them are in any way indicative of the average result of torpedo trials as a whole, then perhaps the mediocre performance of the *Torpedowaffe* during the first few years of war should not come as such a surprise after all.

³²⁵ “Torpedoausbildungsstelle Norwegen Abschrift Betrifft: Schußergebnis des Torpedo-Übungsschießens im Bereich Bergen,” B. Nr. G 20/41, PG 47375, National Archives Microfilm Publication T1022, Roll 2778, 101-108

Chapter 8

Analysis of the Organs of the *Torpedowesens* (TI, TVA, TEK)

Hand in hand with their flawed methods, a large portion of blame must be born by the various agencies that carried out these tests, and which were responsible for performing research and development work during the prewar period, namely the TI, and its subsidiary agencies the TVA and the TEK. Together these agencies, under the direction of the military, held a total monopoly on all aspects of torpedo development, testing, and production, completely independent of any outside competition from the private sector. This autonomy turned out to be a major weakness, as the efficiency of the organizations was severely handicapped by an inflexible and unwieldy organizational structure that could not function in the face of calamitous personnel shortages, as well as by an increasingly muddled network of communication made worse by the petty internal rivalries and jealousies of the individual agencies themselves.

Organization

Theoretically, each agency was in charge of its own sphere where it performed its own unique functions. The TI for instance was the head agency and had charge of torpedo technical development and maintaining operational readiness.³²⁶ It also handled most personnel matters, and was responsible for providing, training, and organizing the necessary staff for the TVA and

³²⁶ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, "Verantwortung trägt allein Inspekteur TI," Anlage d, Band II, seite 139-140, PG 31057, National Archive Microfilm Publication T1022, Roll 3467

TEK.³²⁷ The TVA on the other hand was, according to its head, the “trying out organ” of the TI, responsible for performing the necessary tests and trials for torpedo development, as well as for manufacture and procurement.³²⁸ In addition, the TVA was tasked with caring for and maintaining the torpedo’s state of readiness, and was more than any other agency responsible for finding and correcting weaknesses.³²⁹ As mentioned before, for most of the prewar period all questions regarding tests was the exclusive domain of the TVA, but in 1937, with the creation of the TEK, this began to change. From now on, while the TVA would continue to be the primary agency to investigate the complaints of and test the torpedoes of the front, the TEK now had the task of testing the new products produced by the TVA as well as the armament of ships, in addition to carrying out whatever additional testing might be assigned to it by the fleet, such as the aforementioned *Albatross* shootings.³³⁰ The very existence of the TEK was resented by the leadership of the TVA, who not only viewed the agency as encroaching upon its prerogatives, but also as being an admission of distrust from Naval Command on the TVA’s ability to ensure the reliability of its own products.

Communication between these organs of the *Torpedowesen* and the front proceeded along equally straightforward lines. Early in the war, both BdU and the TI realized the importance of making available to its technicians a detailed and accurate source of information about the wartime use of and experience with the torpedo. As a result, it was agreed that each U-boat and surface vessel would include in its war diary a separate section known as the

³²⁷ Ibid., “Verfahren Personalwirtschaft,” Anlage w, Band IV, Seite 77, PG 31057, National Archive Microfilm Publication T1022, Roll 3467

³²⁸ Ibid., “Verantwortung trägt allein Inspekteur TI,” Anlage d, Band II, Seite 139-140, PG 31057, National Archive Microfilm Publication T1022, Roll 3467

³²⁹ Ibid., “Mängel beseitigt. Lediglich schlechte Tiefenhaltung übrig geblieben,” Anlage f, Band III, Seite 29, PG 31057, National Archive Microfilm Publication T1022, Roll 3467

³³⁰ Ibid., “Im Frühjahr 39 in Sitzung hat Wehr gesagt . . .,” Anlage o, Band III, Seite 75R, PG 31057, National Archive Microfilm Publication T1022, Roll 3467

Torpedoschussmeldungen (torpedo firing reports), a copy of which would be forwarded to the TI. This report included detailed information about each torpedo shot, such as the type and number of each torpedo and pistol, the behavior of each torpedo during the run and its result, as well as the fire control settings and other information about the firing conditions.³³¹ Upon receipt the *Torpedoschussmeldung* would be reviewed by the TI, which would then issue an opinion that would be sent to OKM, the TVA, TEK, and the *Torpedoschule* (TS – torpedo school). These formed the statistical basis of the monthly shooting evaluations compiled by OKM.³³² As a whole, the *Torpedoschussmeldungen*, which the TI described as “the only source of coverage . . . for the evaluation of wartime experience,”³³³ represented its most important informational resource, and great effort was expended to make it as detailed as possible.

This seemingly clear-cut division of labor was strained to the utmost, however, by a chronic shortage of available personnel, which only grew worse as the war progressed. According to Junker, there were simply not enough technical experts available to go around between the TI, TVA, and TEK, not to mention the rest of the Wehrmacht.³³⁴ The personnel crisis grew to such great heights that, as stated by KzS Höppner, even as the court martial of Admiral Wehr and others were underway, roughly 50 percent of the available places at the TVA remained unfilled.³³⁵ Nor were the TVA’s staffing difficulties alleviated by the TI, who according to Admiral Wehr frequently snatched up the TVA’s best engineers and technicians for

³³¹ “Torpedoinspektion Abschrift Betrifft: Meldung über Torpedowaffe,” B. Nr. G 6940T, 24.10.1939, PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

³³² “Torpedoinspektion Abschrift Betrifft: Schußmeldungen der Torpedowaffe,” B. Nr. G 386T, 22.1.1940, PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

³³³ “Torpedoinspektion Abschrift Betrifft: Frontmeldungen über die Torpedowaffe,” B. Nr. G 7771T, 7.12.1939, PG 34427/76, National Archives Microfilm Publication T1022, Roll 3895

³³⁴ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, “TI keine Entscheidungsbefugnis. Personal knapp,” Anlage s, Band IV, seite 74/75, PG 31057, National Archive Microfilm Publication T1022, Roll 3467

³³⁵ Ibid., “Bemühungen um Besserstellung,” Anlage bb, Band IV, seite 95, PG 31057, National Archive Microfilm Publication T1022, Roll 3467

reassignment elsewhere. In this jungle Wehr had to fight what he termed a “constant battle” with the TI and the OKM to not only acquire enough workers to keep his organization afloat, but also to prevent key members of his staff from being reassigned elsewhere.³³⁶ To accomplish this Wehr had to resort to a variety of measures, such as placing ads in local newspapers, negotiating with various labor departments, and offering incentives in the form of improved working conditions. Unfortunately, however, his efforts were hampered by his inability to alter restrictions preventing wage increases.³³⁷ To make itself more competitive with other organizations, the TVA frequently tried to circumvent the burdensome wage restrictions by intentionally over-classifying the skill level of their employees so that they might be eligible for additional pay incentives.³³⁸

In terms of prewar torpedo development, the “strained personnel situation” was particularly evident when it came to the “quick processing and analysis of torpedo reports,” which was deemed as being “no longer feasible in the usual way.”³³⁹ This in turn led to a restructuring of the system of reporting and assessing torpedo trials. The time between the conclusion of a shooting section and the delivery of the results to the TVA was increased from ten days to a period of three weeks. From here the results filtered down to the rest of the organizations. After processing the reports, which took yet more time, the TVA sent the results to the TS, which in turn sent things to the TEK, which finally passed the results along to the TI. Only then would the results be presented to OKM and the individual commanders. In addition,

³³⁶ Ibid., “Ständiger Kampf um Personal,” Anlage e, Band II, seite 140-141, PG 31057, National Archive Microfilm Publication T1022, Roll 3467

³³⁷ Ibid., “Wehr selbst alle möglichen Wege beschritten,” Anlage f, Band II, seite 141-142, PG 31057, National Archive Microfilm Publication T1022, Roll 3467

³³⁸ Ibid., “OKM teilte Gründe für Ablehnung von Beamtenstellen nicht mit,” Anlage aa, Band IV, seite 83, PG 31057, National Archive Microfilm Publication T1022, Roll 3467

³³⁹ “Torpedoinspektion Abschrift Betrifft: Torpedoberichterstattung,” B. Nr. G 8031A, 27.12.1937, PG 34427/75, National Archives Microfilm Publication T1022, Roll 3895, 66

the TVA took over the technical evaluation of all shots. Although this may have made the system more manageable, it also had the unfortunate effect of hampering things by making it much slower.³⁴⁰

Not surprisingly, one effect of this staffing crisis was a gradual blurring of the differences that separated one agency from the next, as the delineation of responsibility came to be determined less by the agency's original mandate and more by the size of its workforce. In practice, this led to an eventual takeover by the TVA of the research and development prerogative of the TI, which according to Wehr had neither the personnel nor the amenities to perform such work or effectively assert leadership in this area.³⁴¹ This shift in influence was the subject of much comment during the courts-martial, the gist of which was that despite the burden of the wage restrictions, the TVA had been able to do a better job than the TI of retaining the best and brightest personnel. KzS Turnow of the Navy Department of Personnel, for instance, spoke of a growing contrast between the TI and the TVA in terms of staffing,³⁴² while Götting's chief of staff, KzS Junker, said that he could "not guess by which way the TI, without the required staff, could exercise supervision over the TVA in torpedo development." This supervision, as he was to say, had long since passed to the OKM.³⁴³ Aside from possessing a smaller and inferior staff, the main cause of the TI's decline, Junker thought, was that they also did not possess any actual decision-making power (*Entscheidungsgewalt*), and so could not force the other agencies into line. Because of this, the TI had in his opinion devolved into a "type of

³⁴⁰ Ibid., 66

³⁴¹ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, "Verantwortung trägt allein Inspekteur TI," Anlage d, Band II, seite 139-149, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁴² Ibid., "OKM teilte Gründe für Ablehnung von Beamtenstellen nicht mit," Anlage aa, Band IV, seite 83R, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁴³ Ibid., "Aufsicht der T.I. über T.V.A.," Anlage u, Band IV, seite 75, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

going-through station” for communiqués between OKM and the TVA, to the point where the actual control of torpedo development came straight from the Naval High Command.³⁴⁴

Communication

As initiative passed from the TI to the TVA, communication and cooperation between the two agencies also seems to have become increasingly muddled. Theoretically, according to Admiral Faber, as the subordinate agency the TVA was supposed to be tightly controlled by the TI, which was to be frequently kept informed of new developments through a variety of means. The most important of these were regularly mandated quarterly reports from the TVA to the TI known as the *Viertelsjahresberichte*, which theoretically should be composed of all data concerning modifications, tests, and alterations, etc that had been performed by the TVA since its last scheduled report.

In addition, since the smallest modification to a torpedo supposedly had to be approved beforehand by the TI or by the OKM, alongside the quarterly reports there developed a more frequently-occurring system of updates through independent special reports. These could cover any number of things, such as when the TVA had uncovered a malfunction and was attempting to repair it, or if an alteration had been performed that still did not result in the removal of the malfunction. Essentially, any time the TVA uncovered a flaw or decided to make a change, they had to first alert the TI.³⁴⁵

³⁴⁴ Ibid., “T.I. keine Entscheidungsbefugnis,” Anlage s, Band IV, seite 74/75, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁴⁵ Ibid., “Selbstverständlich Meldung an T.I. über Mängel,” Anlage b, Band III, seite 24R-25, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

Finally, there was a large number of technical and military advisors (*Referenten*) attached to both the TI and TVA who came to play a crucial role in facilitating communication.

According to KzS Scherf, who himself served as an advisor to the TVA before heading the TEK, the function of the *Referenten* was to test fire and gain familiarity with the weapon systems of individual ships.³⁴⁶ In addition to this role, these advisors, in order to gain a general sense of familiarity with the practices of the persons they were to advise, generally made it a habit to be present at every test firing and trial, and according to Wehr constituted a constant presence at the TVA and the TI.³⁴⁷ In this way the *Referenten* attached to each agency had ample opportunity to interact with each other and hence keep the heads of the different agencies generally well informed on the activities of the other.

But as the TVA took over the initiative in matters of development, the rules governing interaction between it and the TI were increasingly ignored so that communication between the two agencies came to depend far more on the personality of their heads than on official regulation. This is clearly evident from the testimony of the two different chiefs of the TVA, Admirals Faber and Wehr. For instance, whereas Admiral Faber asserted that formal communication during his time at the TVA depended on the quarterly reports, his successor, Admiral Wehr, claimed that he only needed to submit a formal semi-annual (*halbsjährlich*) activity report. In addition, while Faber referred to a plethora of individual reports emerging from the requirement that all work performed by the TVA had to first be cleared with the TI, Wehr claimed that “naturally each newly emerging problem did not occasion a special report to the TI,” which in view of the frequency with which problems were turned up by the TVA,

³⁴⁶ Ibid., “Nichterprobung der MZ,” Anlage i, Band III, seite 45-46, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁴⁷ Ibid., “Berichterstattung an TI,” Anlage g, Band II, seite 148-149, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

“would have been an absurdity, and was at any rate not expected.” Further in contrast to Faber, Wehr said that there was not even any standing order that incidents of special importance should be reported to the TI outside of the official bi-annual report.³⁴⁸ At any rate, according to Wehr the TI would have been kept up to speed by steady and daily phone traffic between the two organizations and by the *Referenten*.³⁴⁹ However, according to Kattentidt, a member of the *Referenten* stationed at the TVA at the time, the ability of the *Referenten* to simply uncover torpedo failures of the sort here described and pass them along with suggestions to the relevant personnel was very much curtailed by basic military regulations. Simply reaching Department T (development) with suggestions arising in the course of testing required in his words a “certain battle and a formal ‘showing off/exercise of authority’ (*Auftrumpfens*) from Admiral Wehr or the Chief of Staff.” Kattentidt added that he found this type of military control “very undesirable.”³⁵⁰

Relations between the Agencies

The less than friendly feelings between the TVA and the TEK, stemming from the perceived encroachment on the part of the latter on the prerogative of the former, has already been mentioned. Setting this mutual antagonism aside was not always easy and often affected the ability of the two to see clearly on issues where both agencies were involved. Göttings’ Chief of Staff, KzS Junker, for instance, testified that the TVA almost always rejected out of

³⁴⁸ Ibid, “Keinerlei Veranlassung über erstmalige Zweifel an Tiefenhaltung an T.I. zu berichten,” Anlage I, Band II, seite 168-169, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁴⁹ Ibid, “Berichterstattung an T.I.,” Anlage g, Band II, seite 148-149, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁵⁰ Ibid, “AZ-Erprobt mit Cementkopf erst Frühjahr 40,” Anlage ee, Band IV, seite 117, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

hand the advice and or criticism of the TEK with vague referrals to some alleged one-time statement by the *Frontbefehlshaber* to the TVA head (Wehr) about the good performance of the torpedoes.³⁵¹ Nor it seems were relations between the TVA and the TI much better. Indeed, the TI more often than not appears to be the subject of scorn from those at the TVA. In his testimony Wehr frequently accuses the TI in regards to the personnel situation of not having “the necessary understanding for the importance of the TVA,” and of stealing his most important technicians and failing to replace them with anyone adequate.³⁵² In Wehr’s view, the main purpose of the TI was to support the TVA with personnel and financial resources, and to throw its weight behind the TVA during negotiations with the Admirals, matters in which Wehr said he noticed more or less no effort from the TI.³⁵³ Wehr’s complaints are also echoed by Junker, who accused the TI of failing to properly perform its job of providing competent personnel. In his words, “the officers and technicians, to be disposed of by the TI, were after their preparatory training not in the position to address the TVA in anything, aside from opposing the TVA at their every attempt to take assume more control.”³⁵⁴

Mindset

Internal difficulties aside, one might say that the different organizations of the *Torpedowesen* suffered from an error of mind or judgment. In the opinion of Dr. Cornelius, the

³⁵¹ Ibid., “Unterbewertung – Unterbesetzung,” Anlage o, Band III, seite 75R-76R, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁵² Ibid., “Noch Personal für T.E.K. fortgenommen,” Anlage h, Band IV, seite 23-24, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁵³ Ibid., “Verhältnis zur Inspektion,” Anlage n, Band IV, seite 30-32, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁵⁴ Ibid., “Denkschrift der T.I. über Umorganisation,” Anlage r, Band IV, seite 73, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

agencies had too broad a focus, so that too few persons tried to handle too many tasks. This speaks of a need of specialization and an awareness of resources. Using the depth problem as an example, Cornelius pointed out that once the TVA's focus was narrowed down and the problem recognized progress moved at a brisk pace, so that a solution was achieved after roughly six months in May 1940.³⁵⁵ In his opinion, if in appreciation of the importance of depth-keeping further extraneous research and development work had been ceased, or at least greatly curtailed, and all resources been diverted to fixing the *Tiefenapparat*, then the problem would for certain have been solved much earlier than it was.³⁵⁶ This of course speaks directly to the effects of the personnel shortage described earlier. The lack of available workers, especially scientists and technicians, meant that the resources to simultaneously pursue further research and development projects as well as fixing the current problems simply did not exist.

Certainly the biggest flaw in the thinking of the *Torpedowesen*, and the one responsible for the most harm later, was the prewar assumption that the magnetic pistol would be the answer to all problems. As has already been mentioned, the lack of attention paid to depth-keeping, despite its being known as early as 1936, was a deliberate outcome of this. In Admiral Wehr's words, "Shortcomings with depth-keeping were not of any especially important military interests, under the assumption that a flawless MZ was in existence...With a functioning MZ, the depth-keeping was of not of decisive importance because it would not play any role whether an MZ shot ran some two meters under the set depth or not. Moreover, an occasional shallow running of the torpedo was not of any consequence, as in this case the pistol would automatically

³⁵⁵ Cornelius is of course mistaken – the final problems with depth were not recognized until 1942.

³⁵⁶ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, "Fehlen von Netzschüssen beim G7e. Von militärischer Seite zu fordern," Anlage h, Band III, seite 29R-30R, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

function as an impact pistol.”³⁵⁷ Even had someone thought to include the depth problem in a report to the TI, Wehr was of the opinion that it would not have done any good, unless the report was written in the correct style, which apparently mattered more than the content. In other words, it was not enough to simply state in a report the nature of a problem; one had to also state how this problem could negatively impact the front.³⁵⁸

³⁵⁷ Ibid., “Mit Ausfall der MZ war eben nicht zu rechnen,” Anlage m, Band II, seite 169-170, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁵⁸ Ibid., “Keinerlei Veranlassung über erstmalige Zweifel an Tiefenhaltung an T.I. zu berichten,” Anlage I, Band II, seite 168-169, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

Chapter 9

Assessing Culpability

As mentioned earlier, the question of guilt during the *Torpedokrise* was decided at the time by a court-martial that resulted in the convictions of Admiral Wehr, Dr. Schreiber, and Dr. Rothemund, and their sentencing to various terms of imprisonment. But as we have just seen, the torpedo crisis was hardly the result of the actions of one man, or even three, but was instead a collective failure, and the product of several factors both human and institutional. At the time, of course, given the immediate need for scapegoats and the demands of a war still to be won, the extent to which these additional considerations affected the sentencing of the accused was likely limited, and as such, warrants a re-examination of the question of culpability.

Culpability for the Defective Pistol

The nature by which torpedo tests were carried out makes assigning blame a difficult issue. As mentioned earlier, the methods under which trials were conducted greatly handicapped the ability of observers and technicians to judge the effectiveness of the weapon from the results. As a result there is near unanimous agreement among those questioned that they had not seen from tests any of the problems later experienced in combat. Scherf claimed that while the G7a exhibited some minor shortcomings during his time as *Referent* with the TVA, he had not noticed anything in terms of Pi problems or depth-keeping.³⁵⁹ Likewise, Wehr's predecessor at

³⁵⁹ Ibid., "Frontreiferklärung von T.V.A. nicht erfolgt O.K.M. befehl," Anlage k, Band III, seite 51R-52, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

the TVA, Admiral Faber, testified that while the G7a at times displayed certain *Kinderkrankheiten* that he took up with Dr. Cornelius, he had not noticed anything wrong with the AZ or MZ detonator.³⁶⁰ For his part Wehr said that during his tenure as head of the TVA he had never noticed anything wrong with the MZ part of the PiG7a.³⁶¹ Neither, he continued, had his predecessor, Admiral Faber, or assorted subordinates, ever mentioned to him the possibility of the MZ having been introduced to the fleet without having undergone adequate testing.³⁶²

Consequently, despite the court martial ruling, it is difficult to see Wehr as being responsible for the weaknesses with the pistol during the war. Although he theoretically could have taken the initiative and forced the TVA to conduct at least some limited live firing drills, given the fact that the pistol had been approved by the Navy and introduced before his arrival at the TVA, and as he neither seen nor heard any complaints of it since, the need for this would not have been present. In the absence of these live firing drills it would have been impossible for Wehr to have anticipated the poor behavior of the pistol during the war. Moreover, if anyone at the TVA should be blamed for the pistol's later weaknesses, or rather for not taking the initiative in matters of live firing exercises, that person should be Wehr's predecessor, Admiral Faber. As is pointed out by KptL Scherf, aside from being instructed on the state of the pistol by Admiral Hirth, whom Faber replaced at the TVA, as Chief of Staff of the TI at the time of the pistol's initial proving trials, Faber would have been aware of all the details of their acceptance, and

³⁶⁰ Ibid., "G7a zu seiner Zeit schon in Front eingeführt," Anlage a, Band III, seite 24-24R, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁶¹ Ibid., "Über Kriegsbrauchbarkeit der Pi G7a keinerlei Zweifel," Anlage h, Band II, seite 150-151, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁶² Ibid., "Ungenügende Erprobung vor Einführung der Pi," Anlage i, Band II, seite 152-153, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

would presumably have taken this knowledge with him to his new appointment as head of the TVA.³⁶³

Wehr for his part blamed the state of the pistol on the TI, which “as the service supervision authority (*Dienstaufsichtsbehörde*) should have determined before the introduction of the Pi to the front whether the necessary testing had taken place and whether the war-reliability of the Pi was guaranteed.” Had this not been the case, then as the supervising authority it would have been the TI’s duty to inform the TVA.³⁶⁴ Moreover, according to Dr. Schreiber, even after news of AZ pistol failures began to come in from the front the TI still refused to allow him to undertake a *Nachprüfung* of ten AZ shots against a freighter from all possible angles on the grounds that, in Göttings words, this might “overload the TEK.” Had permission in this case been granted, it may well have been possible to discover the source of the AZ problems before the onset of the winter frost period and so have avoided some of the problems in this area during the Norway campaign.³⁶⁵

In the end the organization most responsible for the later setbacks with the pistol likely was not any branch of the *Torpedowesen* but rather OMK itself, which in any event was the authority that gave final clearance to the front readiness of the G7a,³⁶⁶ and was in addition the only authority that had the power to order further testing of the pistol after it had been declared ready for use.³⁶⁷ Moreover, as Bekker points out, during the prewar years OKM repeatedly

³⁶³ Ibid., “Faber muß Bedenken der T.I. gegen Einführung G7a gekannt haben,” Anlage b, Band IV, seite 12, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁶⁴ Ibid., “Ungenügende Erprobung vor Einführung der Pi,” Anlage i, Band II, seite 152-153, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁶⁵ Ibid., “Vorschlag Schreiber 10 AZ-Schüsse,” Anlage c, Band II, seite 129, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁶⁶ Ibid., “Später beim Einschiessen von Armierungen auch gleichzeitig Erprobungen des G7a,” Anlage k, Band III, seite 51R-52, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁶⁷ Ibid., “Vorschlag Schreiber 10 AZ-Schüsse,” Anlage c, Band II, seite 129, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

denied the requests of the TI and TVA to subject the magnetic pistol to more rigorous testing under high seas conditions with the excuse that it had no ships available for the purpose.³⁶⁸

Culpability for Depth Keeping

While the failure of the TI in the years leading up to the war to uncover and remove the problems affecting the Pi G7a pistol in both its impact and magnetic settings must be seen as resulting from the defective policies of the Navy in regards to torpedo testing, and as such cannot fairly be attributed to any one person, the exact opposite was the case in regards to depth-keeping, where the impact of individual incompetence was paramount. In speaking of individual incompetence we are of course referring to Admiral Wehr, who in the eyes of the court-martial was clearly the man most at fault. The brunt of the criticism directed at Wehr was centered on his behavior during the aforementioned October 8, 1939 meeting of the TI/TVA/TEK heads in which Dönitz' order to abandon magnetic firing was discussed, and on his report to Admiral Götting six days later in which he suggested a fixed 3.5 meter depth setting.

As mentioned earlier, Wehr was harshly criticized for failing to mention the torpedo's suspect depth-keeping, despite the fact that with the cancellation of the MZ order this issue was suddenly of the greatest importance, as from now on all shots would have to be done using the AZ setting. However, as Frerich later testified, Admiral Wehr was hardly alone in his forgetfulness. For whatever their reasons (Frerich thought it was the shock of learning that the highly touted MZ had in fact failed to live up to its billing), nobody else then present thought to bring up the depth issue either, even though they were just as well informed as Wehr to its

³⁶⁸ Bekker, 137

existence.³⁶⁹ With this in mind, it does seem somewhat unjust to blast Wehr for failing to remember something that was likewise forgotten by everyone else. At the very least, whatever criticism is directed at Wehr should also be directed to those present who also knew about the depth problems, yet failed to say anything. However, although we might forgive Wehr for his silence during the meeting, his memory certainly should have been refreshed when Götting's chief of staff, Junker, specifically asked him on the way to his car whether the depth-keeping was in order. Additionally, Wehr deserves to be criticized for continuing to remain silent even after the point when his initial shock at the MZ stop order must have worn off. Whereas other persons such as Kattentidt, Frerich, or Junker who like Wehr had also remained silent at the meeting soon afterwards grasped the sudden importance of the depth issue, Wehr himself, who as head of the TVA should have been the first to grasp the importance of the issue, continued to remain silent. Nor is it known how long his silence would have continued had not two of his junior officers (Frerich and Kattentidt) reminded him of the necessity to report the depth problem to the TI.

Moreover, when Wehr finally did act on the advice of his subordinates and reported the depth problem, he did so in an incomplete fashion. As described earlier, far from submitting a detailed account containing everything he had on the issue, what Wehr actually did was recommend a fixed 3.5 meter depth setting. The report contained no other information about the depth problem and even failed to state that there was one, a fact that led Götting to later accuse Wehr of being deliberately vague and not stating the true extent of the depth issue. Wehr for his part responded by saying that the purpose of the report was not to go into detail about the depth problem, but rather to "say to the [commanders at the] front how they must act in order to outmaneuver the disturbances caused through depth-keeping." Additionally, Wehr claimed that

³⁶⁹ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, "Wehr nahm Problem sehr ernst," Anlage n, Band III, seite 67-68, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

it was not necessary to report details to the TI as they were expected to request them, and expressed astonishment that Götting did not in fact do so.³⁷⁰ Although Wehr is correct when he states that the TI could have requested additional information if they had further questions about the content of his report – a fact that earns Götting some level of guilt for failing to do so – one cannot but get the feeling that the incident is far more indicative of a gross under-appreciation by Wehr of the gravity of the situation. After all, surely a person who was fully aware of the seriousness of a particular issue would at some point at least bother to say that it in fact exists!

It will be recalled that during his testimony Admiral Faber claimed that every torpedo modification regardless of size performed by the TVA had first to be approved beforehand by the TI, a fact he claimed that led to the emergence of a large number of independent special reports. If this was at one time the case, then surely one of the more aggravating aspects of Admiral Wehr's leadership, at least from the point of view of the TI, and one which undoubtedly had some negative effect on that organization's ability to carry out its mandate of overseeing the work done by the TVA, was his reluctance to keep the TI informed of his activities by sending out special reports.

Wehr justified this practice on a number of grounds, the most basic of which was that these reports were not mandatory as they occurred outside of the semi-annual report.³⁷¹ In addition, as has been briefly mentioned earlier, Wehr was of the opinion that passing special reports concerning new emerging problems to the TI and especially to the front would actually be damaging to morale and would not do any good unless he could also offer a solution. It was for this very reason that he said he did not make any report to the TI when he first learned from a

³⁷⁰ Ibid., "Anordnung der T.I. 2m weniger als Tiefgang einstellen ist verfehlt," Anlage r, Band II, seite 177-178, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁷¹ Ibid., "Keinerlei Veranlassung über erstmalige Zweifel an Tiefenhaltung an T.I. zu berichten," Anlage I, Band II, seite 168-169, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

Netzschüssen about the continued poor depth performance of torpedoes – even after the introduction of the new depth spring – following his return from vacation on June 20, 1939.³⁷² Like most everyone else at the time, Wehr believed that the depth-keeping was not very important due to the supposedly functional MZ detonation, and consequently did not make a point of passing on such “unimportant” information.³⁷³ Moreover, according to Wehr the sheer number of newly emerging problems and work being performed on the torpedoes on a daily basis made it impractical to send a special report for each one. It is worth remembering that the World War II German torpedo was an extremely sensitive device and could be made to fail from any number of factors, from a short circuit of one of the wires, or the application of the wrong kind of grease to the moving parts, to the more serious malfunctions with depth and the pistol. Issuing a special report for each tiny thing to pop up was simply not practical. Another reason Wehr refrained from filing special reports about depth was that he assumed from the continuous activity of the TEK at the TVA firing range, as well as from the close association of the technical and military advisors of the various agencies, that the TI had already known about the depth issue. Finally, Wehr did not send out individual reports regarding depth-keeping because he felt that the other organizations had not done anything to show him that this was an issue they cared about. For instance, if the *Tiefenlauf* was such a serious issue, then why had the TI as the overseeing authority not demanded a more detailed report of the issue, or ordered the TVA or TEK to undertake controlled tests? Or why had the TEK, as the agency responsible for inspecting and testing the products of the TVA, and therefore ensuring their reliability, not

³⁷² Ibid., “Mit Ausfall der MZ war eben nicht zu rechnen,” Anlage m, Band II, seite 169-170, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁷³ Ibid., “Nachtrag Wehr vom 17.9.40,” Anlage v, Band II, seite 273-275, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

carried out additional tests on their own initiative? In other words, Wehr did not seem to see a need for the TVA to focus on an issue that nobody else seemed to pay much mind to.³⁷⁴

Wehr's reasoning on most of these points is questionable at best. Götting's Chief of Staff, Junker, took great offense to Wehr's statement that he did not file these special reports on the grounds that he was not required to, stating before the court that it was the duty of any officer, particularly the head of the TVA, to report any major problem with the torpedoes regardless of whether he was officially required to or not. Considering its dire staffing situation, the TI was as Junker said extremely reliant upon the help of the TVA to fulfill its mandate of keeping OKM informed of all matters concerning the torpedo. Consequently, Junker saw in Wehr's actions a deliberate personal disloyalty to the TI and the inspector.³⁷⁵

His second point, that reporting the negative results of tests would be bad for morale at the front if one could not simultaneously offer a solution to the problem, is for the most part irrelevant, considering that before September 1, 1939, there was *not* a front whose morale could be harmed. Germany at the time was at peace, and naval leaders, furthermore, had Hitler's word that there would be no war with England for sometime yet to come. At any rate, problems with the torpedo would only have affected the morale of the *U-Bootwaffe* insofar as it deprived the crews of success, or led to their being harmed. As neither was even a possibility in peacetime, Wehr's point is moot. Moreover, even when war did come, this practice would still have caused more harm than good, in that sooner or later the bad news Wehr thought would be so harmful to morale would still be uncovered by the crews during combat. The only question was whether it would be better for the crews to find out about their weapons' defects ahead of time or unexpectedly in the middle of a fight.

³⁷⁴ Ibid.

³⁷⁵ Ibid, "Für älteren Offz. nicht zweifelhaft, dass M. An T.I. zu geben war," Anlage p, Band III, seite 79-79R, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

A misplaced faith in the effectiveness of the MZ, which led to the neglect of other areas of torpedo development, was another flaw in Wehr's mindset, even if it was one he shared with every other officer in the Navy, or at least with every other officer except for his predecessor Faber. During the court martial proceedings Faber was very critical of Wehr on this count, holding as he did that proper depth maintenance was an absolute necessity for a torpedo, one that not even the MZ could compensate for as even one which functioned perfectly was still useless outside of certain magnetic zones. Besides, should the enemy ever develop magnetic countermeasures (degaussing), then success would be determined by the effectiveness of the AZ.³⁷⁶ In addition, as has already been pointed out, because the magnetic field of a metal object grows weaker with distance, proper depth-keeping was just as important for a torpedo equipped with a magnetic exploder as it was for one using the AZ setting. If a torpedo fitted with the MZ setting passes too far beneath a ship's hull, it will still fail to explode even if the zone settings are correct.³⁷⁷

Of all his reasons, Wehr's statement that there was simply too much going on at the TVA to warrant filing a report for everything seems the most plausible. Certainly one can commiserate with the volume of his workload, which was so much that it caused him to suffer a nervous breakdown in the spring of 1939, leading to a leave of absence. Nor is it, in view of the unremitting labor shortages, an easy matter to just say that Wehr should have appointed additional staff to go through all the reports to pick the most important of which to send to the TI. Still, while no solution is given here, one does get the feeling that Wehr perhaps was not the best man for the job, at least in terms of handling stress. It bears mentioning that the TI and TEK

³⁷⁶ Ibid, "Mängel an Tiefenhaltung sind von ausserordentlicher Bedeutung," Anlage c, Band III, seite 25-25R, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁷⁷ Stern, 80

were actually in even worse shape staffing-wise than the TVA, yet neither of their directors suffered breakdowns.

Finally, Wehr's final point – his impression that the TI must either have already known about the depth problem or else not considered it important because they never sent him any directives regarding the matter – sounds more like an excuse for what should rightly be seen as personal irresponsibility. For one thing, for an administrator to fail to pass on important information based on the off-chance that the other agency already knew about it hardly seems a responsible thing to do. Secondly, there is a good chance that the reason he never got any directives from the TI regarding depth problems was because he never informed them that there was in fact a problem. It would be unlikely for TI to order Wehr to focus on an issue that it did not even know existed.

In any event, Wehr's attitude on these points led to the unintentional concealment from the TI of several important modifications to the torpedo carried out by the TVA during Wehr's leadership. By his own admission, at the time of his departure from the TVA more than ninety modifications (forty of which dealt with engine improvements) to the G7a alone had been performed, none of which had been reported to the TI.³⁷⁸ Wehr also neglected to report to his superiors the negative results from several torpedo trials, on the pretext that by reporting the problems without being able to offer at the same time a solution would undermined the morale of the front. As he later claimed, for this reason he withheld the unsatisfactory test results of 215 G7a *Netzschissen* fired at the beginning of September 1939, and in doing so missed a valuable

³⁷⁸ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, "Mit Ausfall der MZ war eben nicht zu rechnen," Anlage m, Band II, seit 169-170, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

opportunity to present his superiors with evidence of the G7a's poor depth-keeping.³⁷⁹

Considering that this *Netzschieszen* occurred at roughly the same time as the British and French declaration of war against Germany, Wehr's decision to not report a major problem with the Navy's primary weapon clearly indicates a tremendous lack of foresight and reasoning.

But to what extent did Wehr's shortcomings actually contribute to the poor state of the depth-keeping at the outbreak of war? Because of his neglect in forwarding to the TI information regarding the depth problem, which went all the way back to the time of the Spanish Civil War, Wehr does make for a tempting scapegoat for all the problems that beset the depth keeping throughout the war. Certainly, many other officers present at the court-martial proceedings, such as Junker, were of the same opinion, and attempted to lay all the blame at Wehr's feet, using as evidence statements of his made in the Spring of 1936 in the presence of the TI inspector that the G7a torpedo was the best torpedo the German Navy had ever possessed.³⁸⁰ However, in regards to the depth problem, we can only fairly criticize him for his performance after June 20, 1939, which is when he returned from a long vacation to learn from a recent *Netzschieszen*, the results of which had been left on his desk in his absence, that the depth problem still persisted despite the introduction of the new depth spring. Prior to this, comfortable in his belief that the new *Tiefenfeder* had in fact successfully solved the depth problem, and lacking awareness for the reasons mentioned above of the problems with the AZ and MZ pistol settings, Wehr would have been completely justified in believing that the G7a was in fact the best torpedo that the German navy had ever possessed.

³⁷⁹ Ibid., "Nach KriegsKriegsausbruch wäre M an T.I. zweckmäßig gewesen," Anlage o, Band II, seite 171-172, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁸⁰ Ibid., "Im Frühjahr 39 in Sitzung hat Wehr gesagt dass G7a bester Torpedos," Anlage o, Band III, seite 75R-76R, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

Immediate criticism of Wehr then concerns his actions in June 1939. Why had he not immediately reported to the TI that the new depth spring was in fact defective? According to Wehr, even had he done so, it would have made little difference because the faith placed at the time in the functioning of the MZ meant that this would hardly have been regarded with any sense of urgency. Even if the MZ-first mindset had not been so prevalent, it would still have been unlikely, according to Wehr, that much to do would have been made of the faulty depth spring, because at the time the priority of the TVA was in the developing of yet newer types of torpedoes, not in perfecting weapons already in the inventory. In his words, “the torpedoes G7a and G7e were for us . . . in nature dead stock.”³⁸¹ This is briefly mentioned by Rössler, who states that even as early as 1934 priority within the TVA was accorded to the development of newer torpedo types to replace the G7a, such as the 420 hp six cylinder engine G7a6, and the G6a, designed to reach speeds of 50 knots.³⁸² Obviously these newer torpedo types never amounted to much, yet are significant in that they diverted valuable resources away from perfecting the older G7a and G7e.

These points, however, in conjunction with Wehr’s additional comments that his failure to bring up the depth problem at the October 8 meeting was ultimately of no consequence to the April 1940 Norway campaign as the depth problem had by then already been known for several months,³⁸³ only divert attention from one important fact concerning Wehr: as a senior naval officer Wehr should have been aware of the potentially grave implications that a faulty depth-keeping device would have for the accuracy and effectiveness of a torpedo – regardless of

³⁸¹ Ibid., “Folgen der 10 Tage verspäteten M,” Anlage t, Band II, seite 181-182, Wehr, Band II, seite 181-182, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

³⁸² Rössler, *The History of the German U-Boats*, 143

³⁸³ Summary of the court martial proceedings against Admiral Wehr and others pertaining to Torpedo failures, “Folgen der “10 Tage” verspäteten M,” Anlage t, Band II, seite 181-182, Wehr, Band II, seite 181-182, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

whether it was used in AZ or MZ setting – and should have recognized the urgency of reporting that to his superiors. As head of the TVA, in addition to informing the TI and stressing to them the importance of depth-keeping, he could have accomplished much by assigning the correction of the depth issue a higher degree of priority than it had. It is certainly no stretch to say that Wehr failed to make full use of his powers in going about fixing the G7a and G7e torpedo, and that he undoubtedly bears a large degree of blame for the depth problems that arose during the war.

Wehr's statement that it was the main priority of the TVA before the war to develop newer types of torpedoes rather than fixing the ones already in existence raises the question of how much the depth problem and other failures were the fault of the TEK, whose task as mentioned before was to test the products developed by the TVA. This argument was in fact brought up during the court martial proceedings in charges against Scherf, the director of the TEK. Given the fact that no verdict was ever given against Scherf, it would appear that this argument was invalidated on several points. For one thing the TEK had received no orders to undertake such testing. Second, the TEK was already busy at the time testing the torpedo armament of newly commissioned destroyers and torpedo boats. Third, the TVA had not reported to the TEK any doubts from its own tests concerning the functioning of the depth. Finally, the new depth spring had been introduced to the front torpedoes before the founding of the TEK in 1937, meaning that it fell outside the TEK area of responsibility, which was only for devices introduced after its creation.³⁸⁴

³⁸⁴ Ibid, "Albatroß-Schießen kein Prüfen Tiefenlauf . . .," Anlage a, Band IV, seite 11-11R, PG 31057, National Archives Microfilm Publication T1022, Roll 3467

Chapter 10

Other Interpretations

As is the case with every historical topic, the history of the *Torpedokrise* is not without its points of contention. In this case, controversy surrounds the extent to which torpedo malfunctions should be seen as the direct result of a faulty design, or whether other factors, such as human error, were primarily to blame. Finally, hand in hand with this effort to downplay the technical defectiveness of the torpedo itself, it is worthwhile to take a brief look at other factors – outside of the defective pistol and depth-keeping device – that could account for the torpedo failures. Although some authors would seem to put these additional factors outside of the main discussion, it is my contention that *any* fixable issue that made the torpedo more likely to malfunction should be included within the realm of the *Torpedokrise*.

The role of Human Error

In the context of the *Torpedokrise*, human error is used to refer to two types of error, as well as two types of persons. There is human error in the form of marksmanship, which belongs exclusively to the commander or the *I W.O.*, depending on who is lining up the shot, as well as human error in the form of technical ignorance about the functioning and maintenance of the torpedo on the part of the officers and the crew.

The most common interpretation, and the one which has probably prevailed so far in this study, is that the torpedoes themselves were just plain bad and that it was all the fault of the TI,

TVA, TEK, and other organizations and personnel ashore that together made up the *Torpedowesen*. This interpretation too often has the unfortunate effect of ignoring the decisions as well as the degree of competency of the most important group of persons – those who actually fired the weapon in combat and whose lives depended on its reliability. These persons are normally treated as the victims – brave seamen whose courage and daring is tragically foiled at the last minute by the incompetence of a pack of faceless technical bureaucrats back on shore. While this interpretation may be largely correct, one cannot ignore the possibility that occasionally it was the actions of the men on board the boat that brought about the failure of the weapon, and in certain cases, their own demise.

As mentioned before, the assertion that the supposed torpedo failures were more the result of human error than mechanical flaws was first raised early in the conflict by the TVA, which responded to Dönitz' initial inquiries with the explanation that the U-boat crews were likely blaming the torpedoes to cover for their captain's own poor marksmanship.³⁸⁵ Given the well known propensity of commanders to exaggerate their successes and downplay their failures, this was actually not an entirely groundless assertion. Indeed, the more famous celebrity commanders, such as Prien or Schepke, were very much prima donnas, who routinely exaggerated their tonnage sinkings, dramatized certain situations to increase their public appeal, or even mixed up facts as is evident in the discrepancies between their claimed success and actual results as verified by post war investigation. Given their tendency to bend the truth, it would be quite reasonable for the TVA to suspect that the commanders were in fact intentionally labeling certain misses as failures in order to cover for their mistakes. Clearly, it reflects far better on the individual to attribute one's lack of success to factors outside of one's control, rather than to one's own personal shortcomings.

³⁸⁵ Newpower, 43

This argument was obviously not accepted by Dönitz at the time, nor should it be accepted today, despite its being repeated on occasion by certain contemporary authors, such as Heinz Trompelt. Simply put, Dönitz' captains, especially the early ones, were too well trained in marksmanship to have been the source of all these misses. From the moment the first of the new U-boat flotillas began their sea training on October 1, 1935, the main emphasis was always on torpedo shooting. As mentioned by Blair, each boat in the flotilla was required to carry out sixty-six daytime submerged attacks and sixty-six attacks from the surface at night, using shots of compressed air in the place of actual torpedoes. During these attacks, a commander was expected to plan his boat's approach, taking into account all sorts of variables such as winds, sea conditions, currents, visibility, water depth, as well as estimating the target's course, bearing, speed, interception angle, and other firing data. Only after completing these 132 simulated attacks would a commander be allowed to use actual torpedoes. From here, he would spend five days each week conducting up to fourteen separate surfaced and submerged attacks over the course of one twenty-four hour period.³⁸⁶

Torpedo practice shooting continued to occupy a high priority in training even as the war progressed and the need to quickly get men out to the front intensified. A document of July 1940 from the BdU organizational department details some of the changes in practice shooting in the *Taktische Unterseebootsfrontausbildungsflotille* (tactical U-boat front training flotilla). This particularly applied to the skipper, who after his officers and crew had completed their basic training in the *U-Bootslehrdivision* and were acquainting themselves with the new ship as it was being constructed in a process called *Baubelehrung*, was required to make thirty-six warlike (*kriegsmäßigen*) submerged shots and twenty-two shots from the surface with the 1st Training Flotilla. After this, upon completion of the boat, the commander and crew still had to undergo

³⁸⁶ Blair, 41-42

the standard TEK shooting, in addition to performing a series of independent shots. Still yet, after conducting their own independent shootings and being cleared through the technical trials by the testing authorities, a process that took about a week, the commander, crew, and boat would then go to a second tactical training with the 2nd Training Flotilla. Over the course of the commander's training with the U-boat training flotillas, which lasted about six weeks including thirty days of shooting practice, roughly 855 torpedoes would be fired for an average of twenty-nine per shooting day.³⁸⁷ In short, whatever his personal shortcomings may have been, by the time a new skipper took his first command he would have received in the training flotillas extensive practice in the aiming and shooting of torpedoes, in addition to whatever first hand experience he may have picked up during his time at sea aboard other vessels. The odds that after all this training he would have been unable to accurately line up and fire a torpedo would have been quite slim.

One of the more prominent present-day advocates of the view that the problems with German torpedoes during the Second World War were in fact more the result of human error and incompetence as opposed to technical design flaws is Heinz Trompelt. Trompelt, author of the book *Eine Andere Sicht*, served from March 1942-September 1943 as the *Torpedo-Mechanikers-Maat* for three highly successful voyages on U-172, commanded by Knight's Cross winner Carl Emmerman, before spending the rest of the war enrolled in various officer training programs. Trompelt's time aboard U-172 was all the more remarkable because of the fantastic success of the boat's torpedoes during that time; a total of sixty-one were fired of which forty-eight were hits, for a staggering hit rate of 79 percent!³⁸⁸ This success and his own first hand technical

³⁸⁷ "Befehlshaber der Unterseeboote Organisationsabteilung Betrifft: Neue Zielschiffe, Torpedoboote und ein starker Schlepper für BdU," B.Nr. Gkdos. 823 C, 3.7.1940, PG 34634, National Archives Microfilm Publication T-162B, Roll 2346.

³⁸⁸ Trompelt, 137

know-how and experience gives his work a certain weight in technical matters uncommon to most books on the topic.

The theme of his work is quite simple. Using data provided by Rössler in *Die Torpedos der deutschen U-Boote*, he compares the hit rate of torpedoes fired in the First World War (51 percent) to those fired in the first sixteen months of the Second World War (57 percent).³⁸⁹ From this fact – that the hit rate of torpedoes of the Second World War was basically the same as or slightly better than those of the first – he arrives at his premise that it was “Not the torpedoes that had [failed], but it was rather human error as a result of unconsidered special conditions.”³⁹⁰

These “unconsidered special conditions,” though never specifically defined, appear by and large to refer to what Trompelt perceives as the inadequate organization and technical training given to U-boat officers as well as those responsible for the on-board care of the torpedo, the *Torpedomechanikers-Maat* (torpedo mechanic mate).

To begin with, Trompelt criticizes the training he received during his *Torpedomechanikers Maatenlehrgang* (torpedo mechanic mate instruction course), training which according to him left him completely unprepared for his first assignment. For one thing, it was assumed during the course, which lasted for two months and twenty-two days, that the student would already have detailed torpedo knowledge from the previous *Gastenlehrgang*, which would have been done with the *Torpedoschulflottille* (torpedo school flotilla) in Flensburg-Mürwik. As a result, a direct working knowledge of the torpedo itself was not included in the curriculum, which instead focused on things such as the torpedo tubes and fire control systems on the U-boat. In fact, the training group to which Trompelt was assigned was

³⁸⁹ For whatever reason, Trompelt’s figure of 57% is significantly too high. The hit rates given by Rössler on page 85, which are 40.25% from September 1939 to April 1940, and 56% from June 1940-December 1940, actually total out to 48%.

³⁹⁰ Trompelt, 138

headed by an individual who had never before even regulated a torpedo! Nor did the training course include any information about how to correct possible problems with the torpedo itself; all instruction was concerned with possible problems with the fire solution calculator (*Vorhaltsrechner*).³⁹¹

Not surprisingly, Trompelt felt that this training, which he in addition deemed to be too short, left him completely unprepared for the challenges he faced when given his first assignment as *Torpedomechanikers Maat* on board the supply boat U-459, where he spent the next year. As it was, this actually turned out to be quite a blessing. As the large and clumsy supply boats were not intended to take part in any of the fighting, Trompelt had an entire year to familiarize himself with the torpedoes on board the U-459. Evidently this came in quite handy, for when he was transferred to the Type IX U-172 he had only four days to familiarize himself with the situation before firing his first combat shot.³⁹²

Trompelt is likewise highly critical of the training he received later as an officer candidate, which as was also the case with his *Torpedomechanikers Maat* preparation, was in his opinion too concerned with educating the officer on the theoretical level as opposed to teaching them what was practical.³⁹³ In particular little attention was paid to educating young officers on technical matters, even though it was these same individuals who would go on to supervise the technical personnel on U-boats upon commissioning.³⁹⁴ Much of this, in Trompelt's opinion, reflected outdated doctrine from the "sailing ship period" (*Segelschiffzeit*) that was more concerned with making new officers into model gentleman than with imbuing them with a working knowledge of new technology and machinery. Such training, which encouraged an

³⁹¹ *Ibid.*, 36

³⁹² *Ibid.*, 136

³⁹³ *Ibid.*, 46

³⁹⁴ *Ibid.*, 160

“expression of aversion to the ship’s machinery and the connected dirtiness,” created a situation in which those ultimately in charge of the on-board serviceability of the weapon had little sense of what they were actually doing.³⁹⁵ This was reflected perfectly in Trompelt’s own officer training, which devoted more time to teaching him how to sail than to understanding the different components of a weapon! Of course, the main problem with his argument, at least as it pertains to the *Torpedokrise*, or with torpedo problems in general, is that Trompelt’s officer training did not even begin until late 1943 – well after the torpedo problem had effectively been solved, and well after the German window of opportunity had effectively been closed. Without knowing the exact nature of officer training in the prewar and early war period, which presumably would differ from that in the later periods as the need to rush more and more men to the front became more acute, it is impossible to tell the extent to which this contributed to the *Torpedokrise*.

Yet proof can be found to support Trompelt’s thesis. For instance, if the entire *Torpedokrise* was exclusively the result of technical problems in torpedo design, then one would expect a fairly constant rate of failures amongst all front-line U-boats. Yet in his war log on March 3, 1940, Dönitz wrote that premature detonations would flare up after lying dormant for a while, and that it was “notable that premature detonations are far more numerous with some boats than with others.”³⁹⁶ This phenomenon is also evident in Trompelt’s book. At a time when the average hit rate for shots fired hovered around 50 percent, during Trompelt’s time on U-172 a total of forty-eight of sixty-one fired torpedoes found their mark, for a stunning hit rate of 79 percent!³⁹⁷ Surely, assuming that the quality of torpedo issued to each boat was constant, then there would have to be some other factor to explain this variance from boat to boat.

³⁹⁵ Ibid., 67 - 68

³⁹⁶ Dönitz, FdU/BdU KTB, 3.3.1940, PG 30259, National Archives Microfilm Publication T1022 series, Roll 2979, 95

³⁹⁷ Trompelt, 137

Other factors that may contribute to or cause Torpedo Failures

People such as Trompelt who feel it is an exaggeration to label the torpedo situation in the early years of the war a “crisis” are often quick to point out that there are numerous other ways in which a torpedo can be made to fail quite apart from a flaw in the design. Indeed, one of the more challenging aspects of the *Torpedokrise* is telling the difference between an actual torpedo *versager* (failure) and the scores of other things, many of which are mechanical, that can go wrong and so cause the torpedo to miss or malfunction. By this reasoning, whatever “crisis” occurred in the early war years was not due to the poor quality of torpedo issued to the boats, but rather to the inadequate skill level of the men who attempted to use these weapons, Allied countermeasures such as degaussing, and the natural elements of the surroundings. A few of these examples are listed below.

The magnetic detonation was susceptible to fail through a number of causes. As mentioned before, magnetic detonation relied upon a change in the magnetic field of the torpedo’s immediate surroundings to close a detonating circuit, thereby triggering an explosion. However, the torpedo’s magnetic detonating mechanism was presumably susceptible to being influenced by the natural magnetic field given off by the U-boat itself, particularly as it lay in the torpedo tube. But once the torpedo was expelled from the boat this magnetic field changed as the torpedo encountered the non-metallic confines of the open water. This difference could, Trompelt asserts, be significant enough to detonate the torpedo at the end of its safety run, which as we know frequently happened. Moreover, the magnetic field encountered by the torpedo was likewise dependant upon things like speed and position. Hence, when the torpedo began to slow

down and change position from the horizontal to the vertical, the magnetic field would change and again theoretically cause a detonation at the end of the torpedo's run.³⁹⁸

Much has often been made of the British efforts to degauss their ships, referring to the process of eliminating a ship's magnetic signature by installing around its hull a series of magnetic coils. While it is impossible to truly ascertain degaussing's success during the war, tests conducted by the German scientist Dr. Bittel in summer 1940 proved that degaussing was hardly as decisive as it is sometimes made out to be. For these tests Dr. Bittel used a torpedo equipped with a special device consisting of three induction pickup coils, three amplifiers, and an oscillograph, which was fitted in the torpedo's dummy warhead. Eighty shots fired against six ships of 500-5,000 tons, some of which had been degaussed and some of which had not, showed that while a difference in induction intensity did exist between the ships that had been degaussed and those that had not, the difference was not enough to prevent the ignition of either a G7a or G7e torpedo travelling a speed of thirty knots at two – four meters beneath the target's keel. Provided that the torpedo ran at the proper depth, it would still detonate even under a vessel that had been degaussed. Simply put, it was impossible to completely remove the induction effects of a ship's hull through standard degaussing methods.³⁹⁹

As an interesting side note, degaussing did have one very beneficial side effect, although it was one entirely unanticipated by the British. As Patterson points out, the suspicion that the English had in fact developed degaussing technology led German weapons developers to attempt to counter this by occasionally increasing the sensitivity of the magnetic pistol. Unfortunately doing so also made the pistol more susceptible to interference from the Earth's magnetic field

³⁹⁸ Ibid., 139

³⁹⁹ Rössler, *Die Torpedos der deutschen U-Boote*, 100

and hence more liable to explode prematurely.⁴⁰⁰ Still, in terms of its intended function, it would seem that degaussing only became truly decisive to the success or failure of an attack in conjunction with the depth-keeping problems that plagued German torpedoes.

The fire control data was another thing that had to be absolutely correct for the torpedo to find its mark. Any miscalculation on the commander's part would result in a miss. Certainly, the commander's task in this regard was not helped by the increasingly complicated firing instructions issued to them by BdU in the early months of the war. Aside from the standard values that had to be plugged into the fire control computer, commanders were increasingly expected to make exact calculations as to the target's weight and draught, the value of which led to further orders regarding zone and depth settings, and type of pistol to be used. As these orders became increasingly complex and encompassed a wider field, the stress placed upon commanders increased proportionally. For one who was trained to conduct an attack using a standard set of variables, simply keeping all of these additional requirements fresh in one's mind must have been quite difficult.

Even perfect firing data was useless if the commander did not also take into account the currents that could alter a torpedo's run track. In places such as the Norwegian Fjords, where the currents were particularly strong and changing, anticipating their behavior was particularly difficult, being done as it was basically by locating a point of reference and measuring speed and direction from this.⁴⁰¹

⁴⁰⁰ Patterson, 45

⁴⁰¹ Trompelt, 142

Chapter 11

Conclusion

German torpedoes within the context of those of other combatants

Although the focus of this study has of course been on the torpedo situation of Germany, and to a much lesser extent of Great Britain, in order to place the *Torpedokrise* in its proper context it is worthwhile to skip over to the Pacific theater and say a few words about the torpedoes of the two other major naval powers who have not yet been mentioned, namely the United States and Japan. In the Pacific the torpedo situation of the Atlantic was essentially reversed, in that it was the Axis forces of Japan who, like Britain in the Atlantic, possessed a sturdy and reliable weapon while the American submarine force, like the German *U-Bootwaffe*, initially struggled. Actually the extent to which the American torpedo situation mirrored that of Germany is really quite remarkable, so much so that we can really view it as a second *Torpedokrise*, the story of which contains all the same elements from an oversized and inefficient torpedo authority at home, to the same exact problems of depth keeping and detonation, and even a charismatic Dönitz-like character in the center, in the person of Charles A. Lockwood, occupying the position of “Commander of Submarines, Southwest Pacific.”

The standard American torpedo at the start of World War Two was the Type 14, which was equipped with the Mark 6 exploder mechanism (detonating pistol). Like the German counterpart, it could be set for either magnetic or impact detonation.⁴⁰² Both torpedo and pistol were the products of the Newport Torpedo Station, a branch of the Bureau of Ordnance

⁴⁰² Newpower, 27

(BuOrd), which like the TI in Germany, held a complete monopoly over and was the “U.S. Navy’s unchallenged authority on all aspects of torpedo design, development, and manufacturing.”⁴⁰³ As in Germany, torpedo development in America was greatly hampered by BuOrd’s refusal to permit live firing exercises. Instead, trials proceeded very much along German lines. In place of a live warhead a dummy head of approximately the same weight was used, only instead of being fitted with a spotlight, it was equipped with a type of camera that took a picture of the target’s bottom as the torpedo passed underneath.⁴⁰⁴

When used in combat, these inadequately tested torpedoes exhibited the same types of flaws as the German G7a and G7e. The torpedoes ran too deep. When the magnetic setting was used, the Mark 6 exploder was liable to detonate prematurely, and with impact setting it sometimes failed to detonate at all. As illustrative of this last point, Newport mentions one incident of July 24, 1943, in which the American submarine *Tinosa* fired a total of fourteen torpedoes at a large Japanese tanker, the *Tonan Maru III*. The first two torpedoes fired missed, the second two detonated but failed to sink the target, while the next ten torpedoes all hit the target but failed to explode.⁴⁰⁵

Although both Germany and the United States eventually fixed these shortcomings, the way in which this was achieved differed significantly. As Newport claims, the naval structure in Germany “stood far more rigidly on protocol and authority” than in America, with the result that Dönitz was more or less forced to deal with the problem by applying unrelenting pressure on the TI, until the latter did something about it.⁴⁰⁶ By way of contrast, the American Navy in Newport’s opinion was far more encouraging of individual creativity, so that Dönitz’

⁴⁰³ *Ibid.*, 23

⁴⁰⁴ *Ibid.*, 29-30

⁴⁰⁵ *Ibid.*, 171

⁴⁰⁶ *Ibid.*, 109

counterpart, Admiral Lockwood, simply bypassed BuOrd and performed his own tests for depth keeping as well as on the defective impact exploder, and handed the results to Nimitz. Upon being so outmaneuvered, BuOrd had little choice but to conduct tests of their own which did in fact confirm that problems existed.⁴⁰⁷

The other player in the Pacific, Japan, had without a doubt the best torpedoes of anyone during the entire war. The standard Japanese torpedo was the Type 93, or Type 95 in its submarine variant, although it is perhaps better known simply as the “Long Lance.” On the outside it differed little from the torpedoes of the other combatants. It had the standard twenty-one inch diameter, was of comparable weight, and was actually shorter in length than the German G7a and G7e. It differed significantly, however, in two main areas: it had a gigantic warhead packed with 171 more pounds of explosive than the next leading torpedo, the British Mark VIII (893 lbs for the Long Lance versus 722 lbs for the Mark VIII). Secondly, it incorporated a revolutionary kerosene-oxygen propulsion plant that gave it an extraordinary range of 9,850 yards in its highest speed setting of fifty-one knots, or a staggering 13,100 yards at forty-seven knots, which by the way was still faster than any other torpedo of the war. By way of comparison, the torpedo with the second highest range was the German G7a which, as mentioned before, could only make 6,560 yards at forty-four knots and 8,750 yards at forty knots.⁴⁰⁸ In addition, aside from being extremely destructive, the Long Lance was reliable. One need only look at the naval battles of Guadalcanal for ample proof of this.

Given the excellent state of Japanese torpedoes, one cannot help but wonder why the Germans never sought help in this area from their eastern ally? One of the more puzzling aspects of the German-Japanese alliance has always been the lack of cooperation between the

⁴⁰⁷ *Ibid.*, 110

⁴⁰⁸ *Ibid.*, 37-38

two countries. Whereas the British and Americans worked together to an unprecedented degree, not only planning joint campaigns but also sharing intelligence and secrets with one another, the Germans and Japanese for all intents and purposes each did their own thing, despite being more than once in a position to help each other.⁴⁰⁹ Although it is by no means certain that the Germans would have been able to make use of the Japanese torpedo, it is nevertheless puzzling that the option was apparently never considered.

Assessing the effects of the Torpedokrise

The trouble with interpreting the effects of the *Torpedokrise* is that all of this lies in the realm of speculation. It is certain, for instance, that the Germans' faulty torpedoes cost them the chance to sink many more ships than they did, but *how* many will never be known, nor will the effect that these additional sinkings may have had upon England. Historians of course are quick to offer their opinions. Cajus Bekker for instance writes that "The failure of German torpedoes lost the U-boats many chances of success, and saved the Royal Navy many ships when their loss, at a time [the invasion of Norway] when Britain was directly threatened, *might have proved the mortal blow . . .*"⁴¹⁰ These sentiments are echoed by Franz Kurowski who asserts in his study of the topic that the torpedo failures during *Weserübung* robbed the Germans of "absolute and decisive results." He goes on to say that the British, "in the face of these completely unexpected sinkings would have been left with no other choice but to accept the German peace proposal of

⁴⁰⁹ For example, although the Americans in the end decided to go their own way in regard to their torpedo problems, information on the British Mark VIII was readily available to them and the possibility of simply adopting the British torpedo was in fact raised by American Vice Admiral R.S. Edwards in a letter to Lockwood. See Newpower, 138

⁴¹⁰ Bekker, 164-165 [emphasis added]

July 1940.”⁴¹¹ This line of thinking is contradicted by others like Blair, who claim that “the U-boat peril in World War II was and has been vastly overblown: threat inflation on a classically grand scale. . .”⁴¹² In light of the fact that “only a tiny percentage of Allied merchant ships actually fell victim to U-boat attacks,” and that “ninety-nine percent of all Allied merchant ships in the transatlantic convoys reached assigned destinations,”⁴¹³ the truth would seem to be that even had the Germans possessed a superb torpedo with a reliable MZ from the beginning they would not have been able to win the war of attrition that followed. Instead, their best shot at victory lay not in wining the tonnage war as a whole but in chance individual encounters. Wilhelm Zahn’s torpedo failures of November 30, 1939, against HMS *Nelson* while Winston Churchill and the top brass of the Royal Navy was aboard counted as such an encounter. So does the opportunity during *Weserübung* of wiping out the British combat and transport fleets deployed to Norway, even more so if Churchill had managed to be killed during Zahn’s attack on *Nelson*. That these two scenarios did not occur is largely the fault of the poor state of Germany’s torpedoes.

⁴¹¹ Kurowski, 370

⁴¹² Blair, xiii

⁴¹³ *Ibid.*, xiii

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