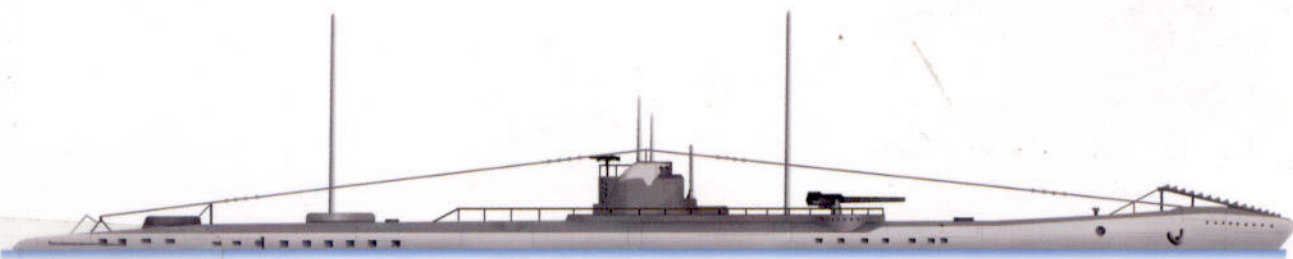
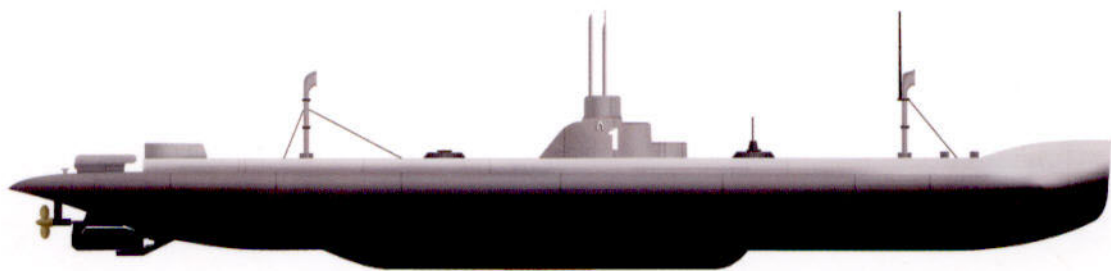


U-boats of the Kaiser's Navy



Gordon Williamson • Illustrated by Ian Palmer

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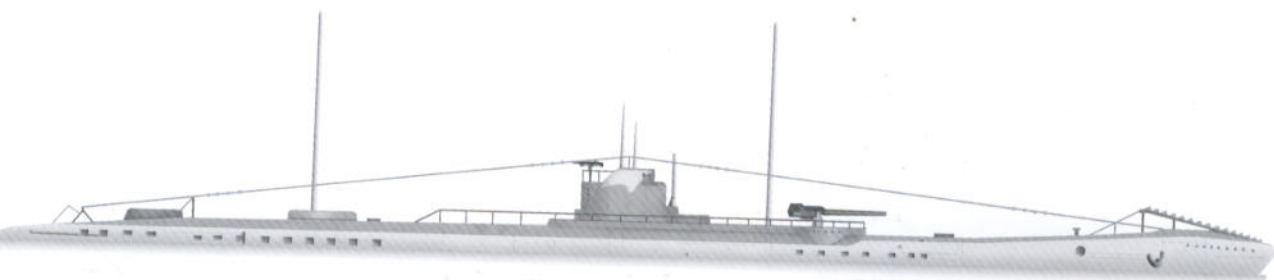
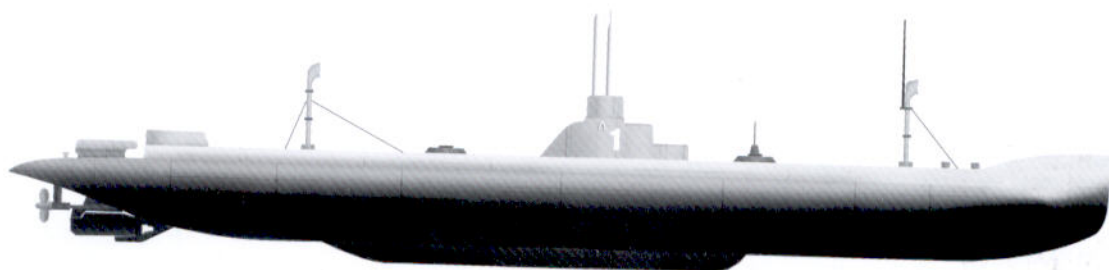


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U-boats of the Kaiser's Navy



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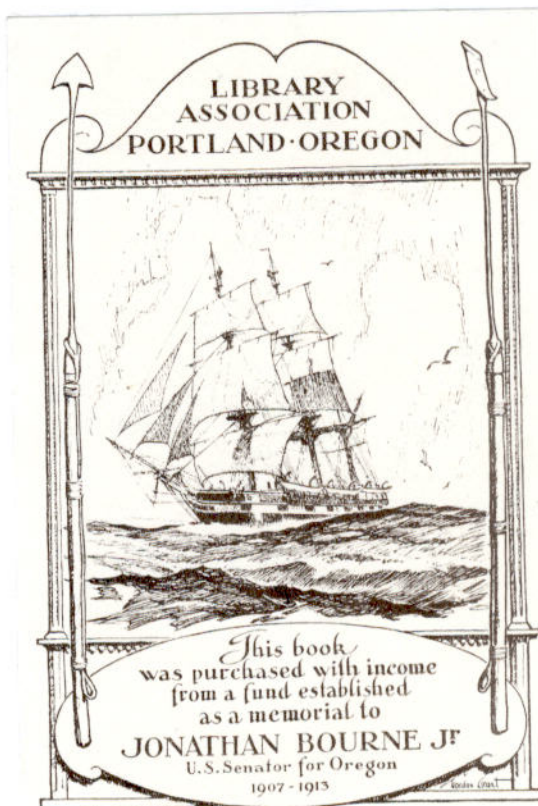
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The *U-Boot Archiv* is the world's finest single repository of information and
photographs relating to the U-boats and is maintained as a labour of love by
Herr Bredow and his volunteer helpers.



U-BOATS OF THE KAISER'S NAVY

THE KAISER'S U-BOATS

Overall administrative control of the Imperial Navy was the responsibility of the *Reichs Marine Amt* (Imperial Naval Department or RMA). Control of the infant submarine force came under the remit of the Torpedo Inspectorate that had been formed in 1899 under Konteradmiral Zeye. He rose to the rank of Vizeadmiral, and on his death in 1909 was replaced by Konteradmiral Lans.

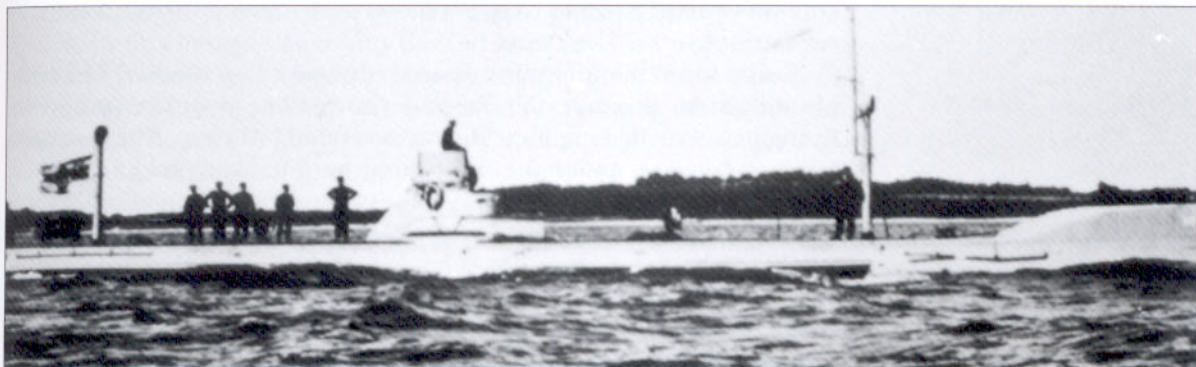
Much of the development until then had been in private shipyards, which hoped to sell their designs to the Imperial Navy or for export. Despite the general prejudice against submarines in the naval hierarchy, the development of any vessel that might have military potential would require close supervision.

In 1904, Naval Engineer Gustav Berling joined the Torpedo Inspectorate with special responsibilities to oversee submarine development. U-1, the first submarine to be taken into the Imperial Navy, was not an officially initiated or approved concept, but had been developed to meet navy needs from an export design intended for the Russian Navy.

The first 'official' German Navy U-boat design, from scratch, taking into account lessons learned from the Russian contract boats and U-1, was in fact the U-2, built by Kaiserliche Werft in 1908, under the auspices of Berling and the Torpedo Inspectorate.

As is narrated elsewhere, Berling suffered a fall from grace in the Torpedo Inspectorate due to the debacle with the development of suitable diesel engines, and his overenthusiastic support for Germaniawerft, whose engine development lagged well behind schedule and caused significant delays in submarine production. He moved from the Torpedo Inspectorate to take up a position with Kaiserliche Werft in Kiel and was replaced by Marinebaureferat Reitz.

U-1, the first submarine to be taken into service by the Imperial German Navy. Of particular note are the huge ventilator tubes fore and aft, which had to be lowered and stowed before the vessel could submerge, making submerging a dangerously long process.



In December 1913, the concept of an independent U-boat Inspectorate was approved and in March 1914 was set up in Kiel with the Chief of Staff U-boat Affairs being Kapitän zur See Nordmann.

THE EARLY DEVELOPMENTAL YEARS

German theoretical design for underwater craft can be traced back to 1465 when a Nuremberg designer produced plans for a boat with the capacity to dive. It was, however, not until the middle of the 19th century that German inventive ingenuity would come to fruition in a practical form, when Bavarian designer Sebastian Wilhelm Valentin Bauer produced the first German submarine, the *Brandtaucher*. Despite the vessel being lost during trials in February 1851 (it was later raised in 1887, subsequently restored and is still in existence today), Bauer was convinced of the basic validity of his theories. He spent the rest of his days, until his death in 1875, designing not only submarines, but also propulsion systems to drive them.

Subsequent craft built by Vogel (1870) and Howaldt (1891) are believed not to have survived beyond their trials, but a later Howaldt effort built in 1897 *did* survive its trials. Although important in the part it played in continuing the development of the submarine concept, it was ineffective and with such poor military potential that it was scrapped in 1902.

In February 1902, design work began on the first truly successful German submarine, the *Forelle*. This vessel was based on the French submarine *Gymnote*, which had been designed by Gustav Zede. It was a small vessel, powered by an electric motor giving a range of just 4.5 nautical miles. Launched on 8 June 1903, it was intended to be carried on, and launched from, a surface warship. The 16-ton submersible carried two torpedoes and performed impressively during its initial trials in the presence of the Kaiser. So much so that Prince Heinrich of Prussia took the opportunity to board her and experience underwater travel for himself. The navy were unconvinced, however, and none was ordered. The Russians, on the other hand, were impressed and immediately bought the small submarine and shipped her home to Russia. Persuaded that the Germans possessed the skills and technology required for building operational submarines, in 1904 the Russians commissioned Krupp's Germaniawerft to build three 205-ton submarines.

Krupp hired the innovative Spanish designer Raymondo d'Equévilly Montjustin to produce the Russian vessels. The Spaniard proposed fitting petrol-fuelled engines, but was overruled by Krupp. The Germans had not failed to notice the difficulties the Americans had faced with their Holland class boats due to the fitting of petrol engines and the number of explosions they had suffered. A paraffin-driven engine produced by the Körting Brothers was chosen instead. The paraffin engines produced vast quantities of thick white exhaust smoke, which required the fitting of tall exhaust vents, these having to be lowered and stowed before diving.



Wilhelm Bauer, the 'father' of the German submarine arm. Bauer's name has been commemorated by several ships over the years, including a U-boat escort ship in World War II. The West German Navy's resurrected Type XXI, the former U-2515, was renamed *Wilhelm Bauer* in 1960.

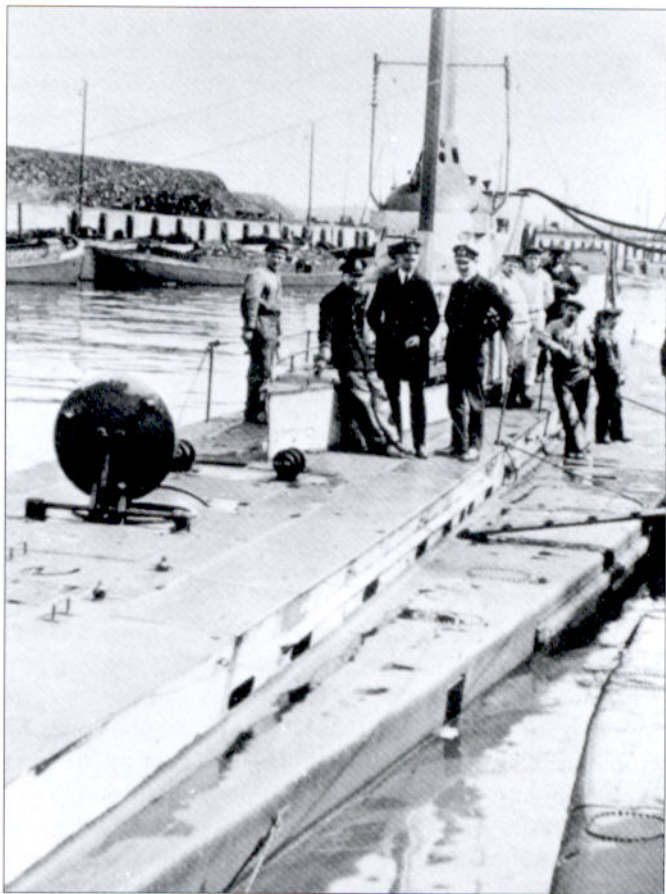
Representatives of the Imperial German Navy took the opportunity to examine the Russian boats before they were delivered to the customer and the decision was taken to order one for the German Navy at a cost of some 1.5 million marks from the 1905–6 naval budget. The design of these 'Russian' submarines (the *Karp*, *Karas* and *Kambala*) was adapted to meet problems as they arose and resulted in the final 'perfected' design, which in turn was used as the basis for the first submarine to be built for the Imperial German Navy, the U-1.

The keel of this first German Navy submarine was laid in early 1905. After some delays due to problems with engine design, and with design improvements carried out as the vessel went through its production stages, the U-1 was finally launched on 4 August 1906. Although bearing strong similarities to those boats built for the Russians, U-1 had evolved into a more advanced form. On 14 December she was officially handed over to the Imperial German Navy and the infant *U-Bootwaffe* was born. The first 18 months of this new submarine's career were spent in intensive trials and testing.

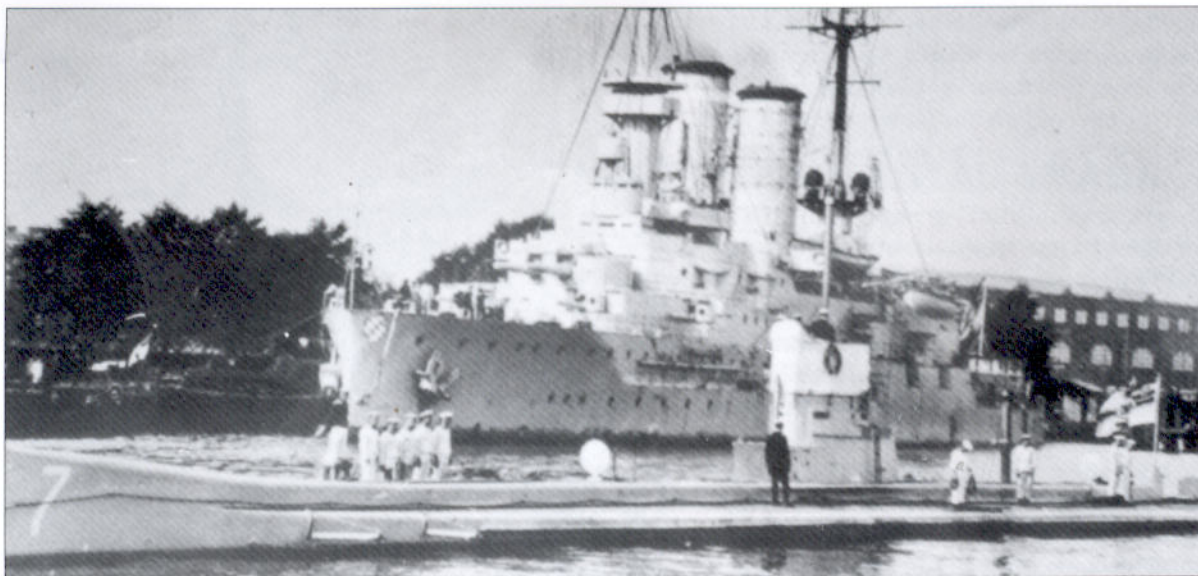
Petrol-driven engines are notoriously dangerous for operation in small, enclosed spaces due to the inevitable build-up of fumes and the propensity of these fumes to explode. Tragic accidents of this type had happened during the course of submarine development in other countries, and the Germans were well aware of the problems. To avoid such dangers, U-1 was powered by a two-stroke paraffin engine. Displacing 238 tons, she had but one torpedo tube, three torpedoes and was crewed by just 12 men. Her speed was a respectable 10.8 knots on the surface and 8.7 knots submerged. Her trials, however, quickly established that she was not entirely suitable for use as an ocean-going vessel, and should be restricted to coastal use only.

U-1 was to be the only boat of her class, so perhaps fittingly the first U-boat to be commissioned into the German Navy was truly a unique vessel. U-1 served on training duties during the First World War and, remarkably, survived the war. She was saved for posterity and is now on view in the Deutsches Museum in Munich. That only one example of her class was built should not be taken to imply U-1 was, in her day, a poor design, but simply reflects the rapidity of subsequent development.

In March 1906, before U-1 had even been completed, the Kaiserliche Werft in Danzig was commissioned to build a new and improved submarine (to become U-2). This vessel displaced 341 tons and had four torpedo tubes and a complement of six torpedoes. She was crewed by 22 men and featured a new engine designed by Daimler. Unfortunately,



U-2, the second submarine taken into service, was the first to be designed specifically for the Imperial German Navy rather than an adaptation of a foreign contract design as was the case with U-1. Note the significant width of the vessel shown here moored at the *Unterseebootschule* in Kiel.



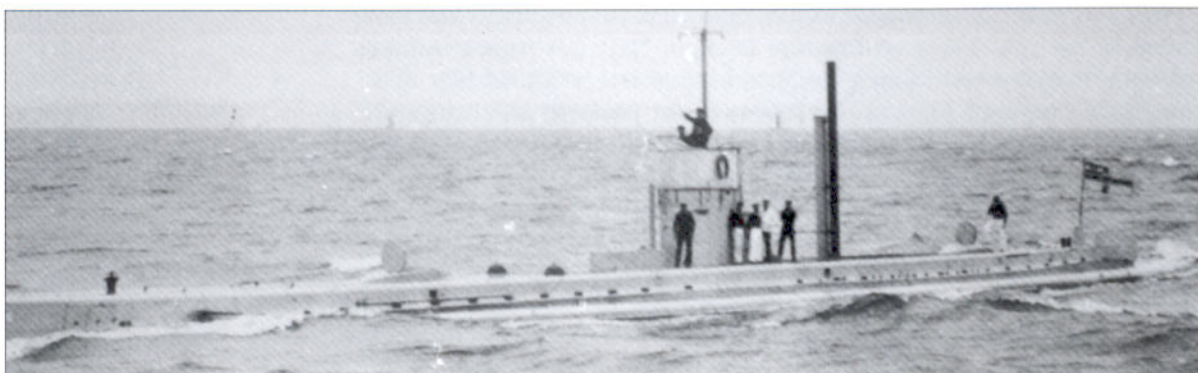
U-7, its sailors in their dress whites, steams past a pre-dreadnaught of the Schleswig-Holstein class.

it proved to be not entirely reliable and was quickly relegated to training duties. Like its predecessor, it was to be the only one of its class.

Kaiserliche Werft also produced two sister vessels, the U-3 and U-4, larger again at 421 tons. Once again, these vessels had their design problems. U-3 sank on departure from port on her maiden voyage in 1911, although the boat was raised on the following day and all but two of her crew saved. The accident had been caused not by any inherent fault in the basic design, but by a malfunctioning indicator on a ventilation valve. The valve had been indicated as closed when it in fact was still open and allowed ingress of water into the boat when she submerged.

German U-boat development was progressing at a much slower and more cautious pace compared to France, the United States and Great Britain. U-5 to U-8 were the next four U-boats to be ordered and were produced by Germaniawerft. Larger than any of their predecessors, at 505 tons, they featured four torpedo tubes, two forward and two aft, carried six torpedoes and were crewed by 29 men. With a surface speed of 13.4 knots and 10.2 knots underwater, they were the fastest as well as the largest submarines yet built. Four very similar boats (U-9 to U-12) were then ordered from Kaiserliche Werft and these eight vessels formed the

U-9 at sea. Note once again, the cumbersome ventilator pipes on the after deck. Moving at slow speed, relatively little smoke is being made.



nucleus of the *U-Boot* fleet. All were superior in both combat potential and seaworthiness to any submarine in service at the time with any other navy.

These boats had been built to match, or attempt to match, a five-point 'wish list' of criteria set by the Torpedo Inspectorate, viz:

- 1 To have a top speed of at least 15 knots on the surface and 10.5 knots submerged
- 2 To have a cruising range of at least 2,000 miles
- 3 To accommodate a crew of at least 20
- 4 To have an on-board air supply for at least 72 hours
- 5 To have a minimum of four torpedo tubes (two forward and two aft), and a complement of at least six torpedoes.

Only in the question of top speed did U-5 to U-8 fail to match requirements, due to continued problems in developing a satisfactory power plant.

A further four 500-ton vessels (U-13 to U-16) were ordered from the Kaiserliche Werft in Danzig in 1909. Only one (U-16) was ordered from Germaniawerft at this time. It is believed that the lack of orders for Germaniawerft was due to the excessive price quoted by them in their contract bid.

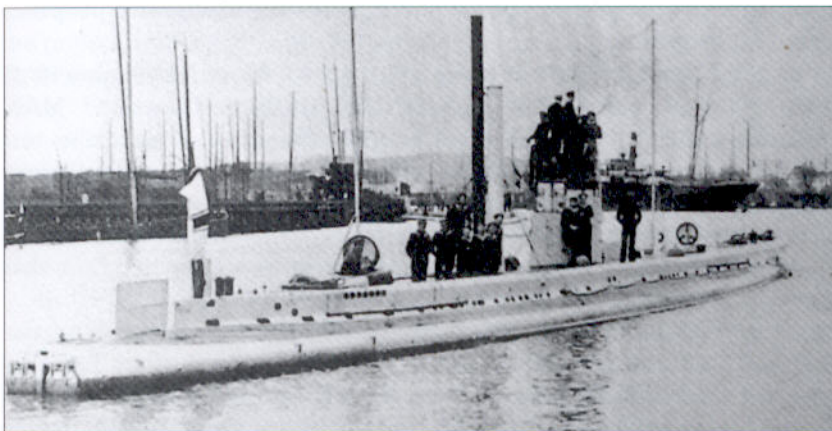
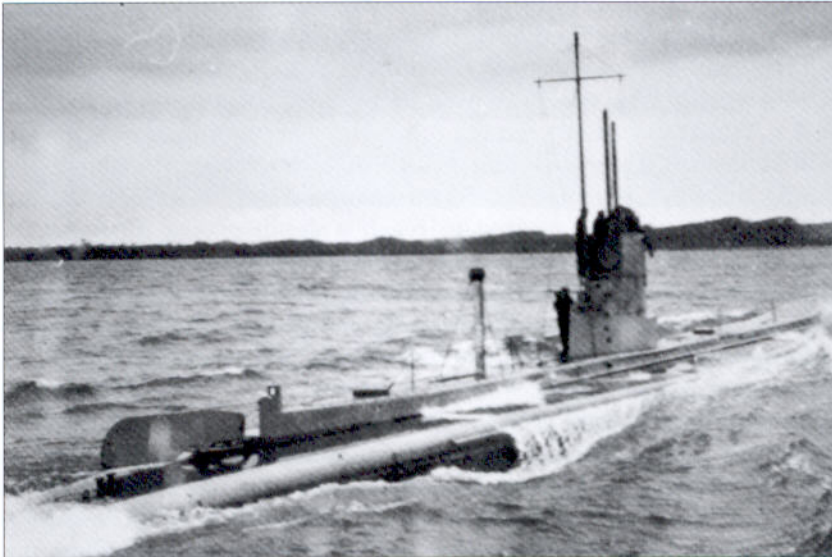
In 1910, Kaiserliche Werft was contracted to produce U-17 and U-18, diesel-powered boats. Once again, however, problems with a suitable power plant resulted in this vessel being completed with a standard paraffin-fuelled engine.

In general terms, the first 20 or so U-boats to be constructed can be considered as the first phase of the development process. None of the designs was anywhere near perfect, each having its own limitations. The vast majority of these vessels were of relatively poor performance in real operational terms, having limited armament, even more limited endurance, long diving times and often poor handling qualities.

The single biggest problem facing German submarine development remained finding an efficient propulsion system.

BELOW U-9 viewed from the stern. Although the hull was relatively streamlined, external fittings such as the ventilator pipes and mast and the requirement for their stowage before diving, meant that the time taken for the vessel to submerge was excessive when compared to later designs.

BELOW BOTTOM A further view of U-9 from the stern. In this shot she is riding higher in the water and her stern tubes can be clearly seen.



The main engines of the early boats burned paraffin and could be used only when on the surface, and were incapable of being run in reverse. The earlier engines were simple six-cylinder, two-stroke machines developing about 260 hp. Later engines were of eight-cylinder configuration and developed around 340 hp. Fuel consumption was heavy, some 400 gallons per hour being required to feed them. A major drawback was that the dense exhaust gases from these engines when the U boat was cruising on the surface could be seen from a considerable distance. The heavy fuel consumption of course resulted in limited endurance, though the diminutive U-1 had completed a round trip of almost 600 trouble-free miles during trials in 1907. When running submerged or in reverse, electric motors powered the boat. The batteries required to power these electric motors were extremely large, very heavy and very expensive. (Each boat required almost a quarter of a million marks worth of batteries – a large proportion of the total cost of the entire vessel.)

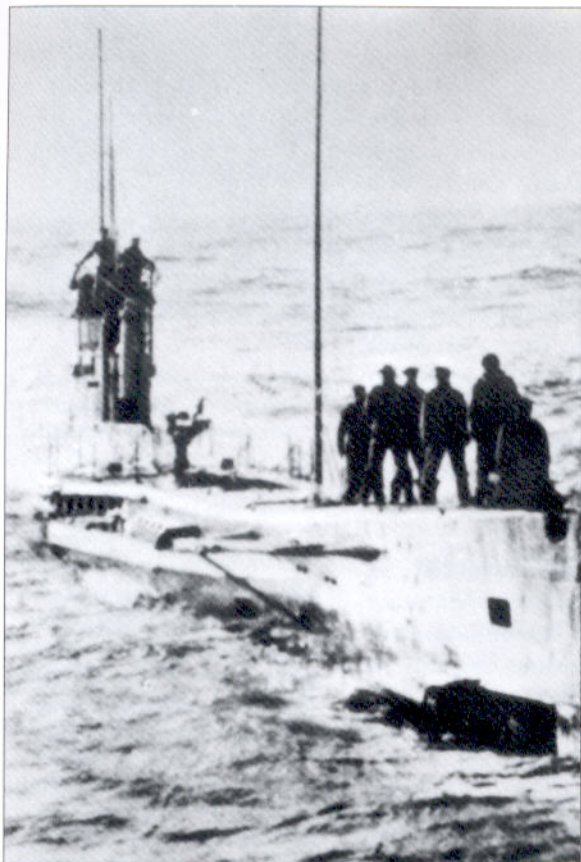
These early boats were not particularly pleasant vessels in which to serve, the first few boats, with their extremely cramped and uncomfortable interiors, being considered unsuitable for anything over a week's occupation at any one time.

The periscopes fitted to most early U-boats, though fitted with first-class Zeiss optics, were but 4.5 m in length, meaning that the vessel could barely remain submerged at periscope depth in anything more than a gentle swell. Communication was principally by radio-telegraphy, and required the use of two large masts, one fitted forward of the conning tower, hinged to fold aft, and the other aft of the conning tower hinged to fold forward. These could be raised and lowered from inside the boat. Diving time on early U-boats was very long, with an average of around seven minutes being required to reach a depth of just nine metres. Finally, most of the U-boats built before the outbreak of the First World War carried two torpedo tubes forward and two aft but a complement of just six torpedoes. Both reloading the individual torpedo tubes and resupplying the boat itself with fresh torpedoes was a difficult, time-consuming and awkward task.

With the many drawbacks to effective performance suffered by these early boats it is no surprise that their intended use was in a defensive role. In 1912 it was decided that a submarine fleet of some 70 boats would be required. A total of 36 boats would be committed to defending the German Bight (*Deutsche Bucht*), a further 12 in defending the approaches to Kiel, 10 in reserve and a mere 12 for offensive purposes in the North Sea.

As the U-boat building programme moved forward, development of diesel power plants for submarines continued apace. MAN (Maschinenfabrik Augsburg Nurnberg) produced a four-stroke test engine in August 1910, though a further year passed before sufficient improvements were made to the design to produce an engine of acceptable standard for service use. The main competitors, Germaniawerft, produced a prototype two-stroke diesel engine that passed its initial endurance testing in October 1912.

Following the acceptance of the MAN engine, with at least the feasibility of diesel power for submarines proven, the Torpedo Inspectorate issued contracts to Kaiserliche Werft for the construction of four MAN 850 hp diesel-powered U-boats (to become U-19 to U-22). Five



months later, Germaniawerft was issued a contract to build four similar diesel-powered boats (U-23 to U-26) using its own two-stroke 900 hp engine design. Kaiserliche Werft subsequently received contracts for four further boats (U-27 to U-30) equipped with the MAN engine but with power increased to 1,000 hp. Strangely, a further order for 11 boats (U-31 to U-41) equipped with a 925 hp version of their own two-stroke engine was given to Germaniawerft, this despite their engines being described as disappointing, unsatisfactory and not matching the efficiency of the MAN engines.

This situation, where the greater number of submarines were fitted with the unsatisfactory Germaniawerft engines, may have been caused by the prejudice of many in the Torpedo Inspectorate against the four-stroke MAN engine. Although quieter and more fuel efficient, it was seen as being beset by resonance problems in the shafts. This apparent favouritism towards Germaniawerft was to lead to the eventual removal of Berling from the Torpedo Inspectorate. Gradually, both the MAN and Germaniawerft engines' teething problems were overcome as each firm ultimately produced an engine of sufficient quality and reliability to withstand combat use in an operational U-boat.

In 1912, it was decided to contract out the production of one submarine to an overseas manufacturer, in this case Fiat of La Spezia in Italy, in an attempt to acquire some expertise in diesel engine production. The vessel (U-42) was a 728-tonner with a 1,250 hp engine of Fiat's own design.

ABOVE LEFT A bow view of U-22 making her way through a heavy swell. The tall radio masts are particularly evident. Note also that by this point U-boats were being fitted with a deck gun, in this case of 8.8 cm calibre.

ABOVE RIGHT Looking aft from the foredeck of U-25. Note the 8.8 cm deck gun and, on the front of the conning tower, a small helmsman's platform provided with a steering wheel. Note also that the radio masts are not centrally located, but are positioned along the side of the deck. U-25 was also fitted with a second 8.8 cm gun on the after deck.

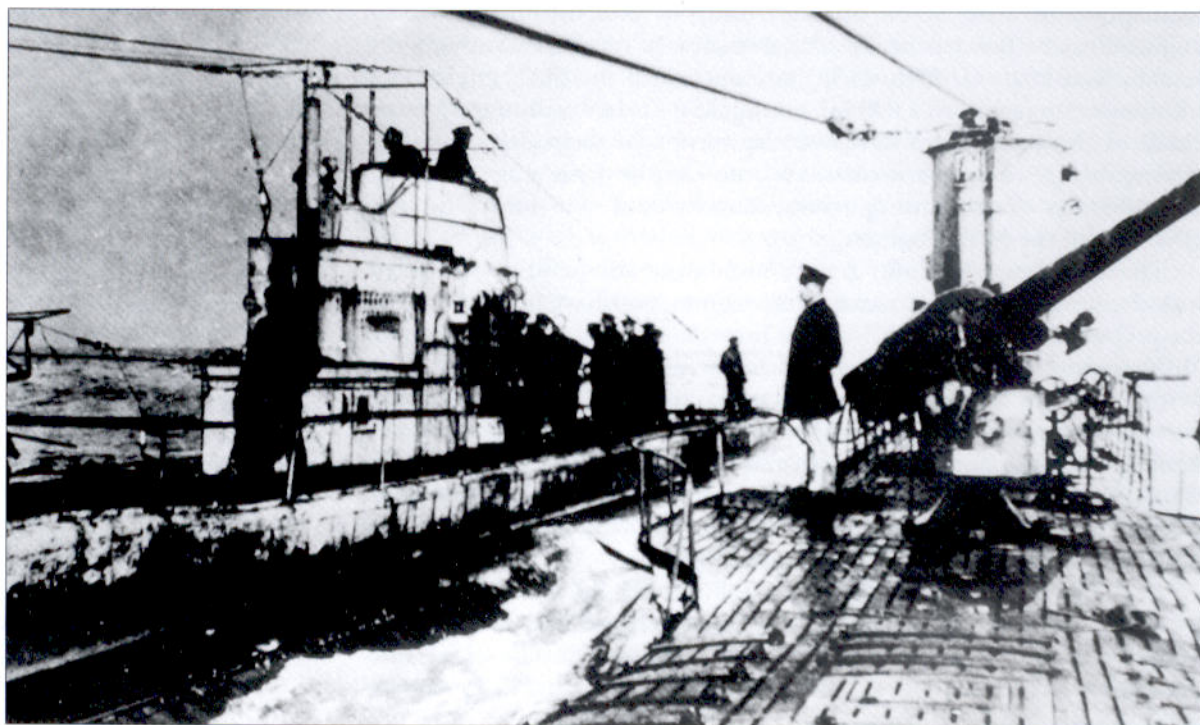
Throughout these difficult early days, Germany had been fortunate in avoiding many of the disasters, at least in terms of human lives lost, which beset submarine development in other nations. This is, however, generally believed to have been a matter of luck rather than due to any inherent superiority in submarine development. Germany had been in the position of being able to learn from the misfortunes of others.

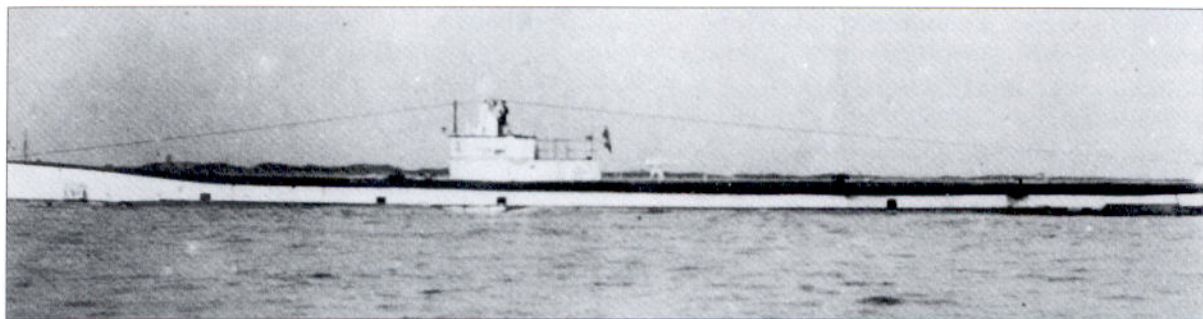
One major development from U-19 through to U-41 was the fitting of an 8.8 cm naval gun to the forward deck of the U-boat. This was to allow submarines to engage unescorted enemy shipping by gunfire, rather than with much more costly torpedoes. Despite the added weight and drag factors, the deck gun was to be a common fitting on WWI U-boats. Only once adequate anti-submarine measures had been developed in WWII would the deck gun eventually be seen as a pointless encumbrance and be discarded. All of these 22 boats were very similar, displacing between 650 and 685 tons, and with similar crew complements, armament and performance in terms of speed and endurance.

By 1913, the Torpedo Inspectorate had become overburdened by the problems it was facing. It was thus decided that a separate inspectorate would be set up to deal with submarines exclusively. It would control training, maintenance, and development of submarines as well as operational control of the Submarine School. The new U-boat Inspectorate was brought into being by an Imperial Decree of 13 December 1913 and became operational in March 1914.

In July 1913, U-43 and U-44 were ordered from Kaiserliche Werft in Danzig. These were 725-ton boats with four forward and two stern tubes. U-45 was added to the order in January 1914, but was actually completed before her two immediate predecessors.

U-55 and U-102 meet at sea. Notice the considerable difference in outward appearance due to the radically different conning tower design. In fact both boats had relatively similar specifications, U-55 at 715 tons and U-102 at 787 tons, both with two bow and two stern tubes, both with two 8.8 cm deck guns, and each crewed by 35 men.





U-43. Although the crew on the conning tower appear totally exposed, a canvas screen was often fitted to the upper part of the conning tower of early U-boats to provide some degree of shelter in rough weather. Though this class of diesel powered boat normally carried two 8.8 cm guns, only the after deck gun appears to have been fitted.

The construction of U-boats for the Imperial German Navy, up to the outbreak of war in 1914, fell almost entirely to just two firms, as summarised below. With the commencement of hostilities, the need for more, and better, boats saw numerous other firms being brought into the picture.

Germaniawerft	Kaiserliche Werft	Fiat
U-1	U-2	U-42
U-5 to U-8	U-3 to U-4	
U-16	U-9 to U-12	
U-23 to U-26	U-13 to U-15	
U-31 to U-41	U-17 to U-18	
	U-19 to U-22	
	U-27 to U-30	
	U-43 to U-45	
<i>21 boats</i>	<i>23 boats</i>	<i>1 boat</i>

On the outbreak of war, U-1 to U-28 were complete and in service. U-31 to U-41 were delivered to the navy over the period from September 1914 to February 1915, the delays in delivery being anything up to 6 months, and, in some cases, over 11 months beyond the originally specified delivery date.

In August 1914, it was decided to award Kaiserliche Werft a contract to build five more boats, U-46 to U-50, whilst Germaniawerft would be awarded the contract for U-51 to U-56. Germaniawerft should, in fact, have been awarded further contracts, but the continued failure to eradicate completely the problems being encountered with its two-stroke diesel engines saw the number ordered from this firm reduced. All these boats were improved versions of the U-41-type vessel. In November 1914, AG Weser was awarded contracts to build six boats, U-57 to U-62, which were improved versions of the U-27 type, whilst Germaniawerft was contracted to build just three boats, U-63 to U-65, 810-ton vessels with two forward and two aft torpedo tubes, being an improved version of the U-56 type. Also in November 1914, the navy took over five U-boats that were being built for the Austrian Navy, and commissioned them as U-66 to U-70, with the model classified as the Type UD. Ordered in January 1915, U-71 and U-72 were constructed by Vulcan, U-73 and U-74 by Kaiserliche Werft and U-75 to U-80 by Vulcan.

With Germany's invasion of Belgium and the acquisition of Channel ports, the first of a new style of boat, the small coastal U-boat, was

ordered. These diminutive craft, weighing just over 150 tons, and with a single propeller, had a small 60 hp diesel engine, backed up by a larger 120 hp electric motor. The top speed was but 5.5 knots (4 knots submerged) and the maximum range just 1,600 miles – sufficient though for operations against the British Isles. These boats had just two torpedo tubes and one machine gun as armament.

Classified as Type UBI, the Germans referred to them as ‘Tadpoles’.

The first eight boats of this class were ordered from Germaniawerft in October 1914. These were UB-1 to UB-8. Nine further boats were ordered from AG Weser, these being UB-9 to UB-17. Germaniawerft managed to set the pace by building a UBI class submarine within an amazing 75 days! So small were these boats, that they could comfortably be split into just five main components and transported by rail.

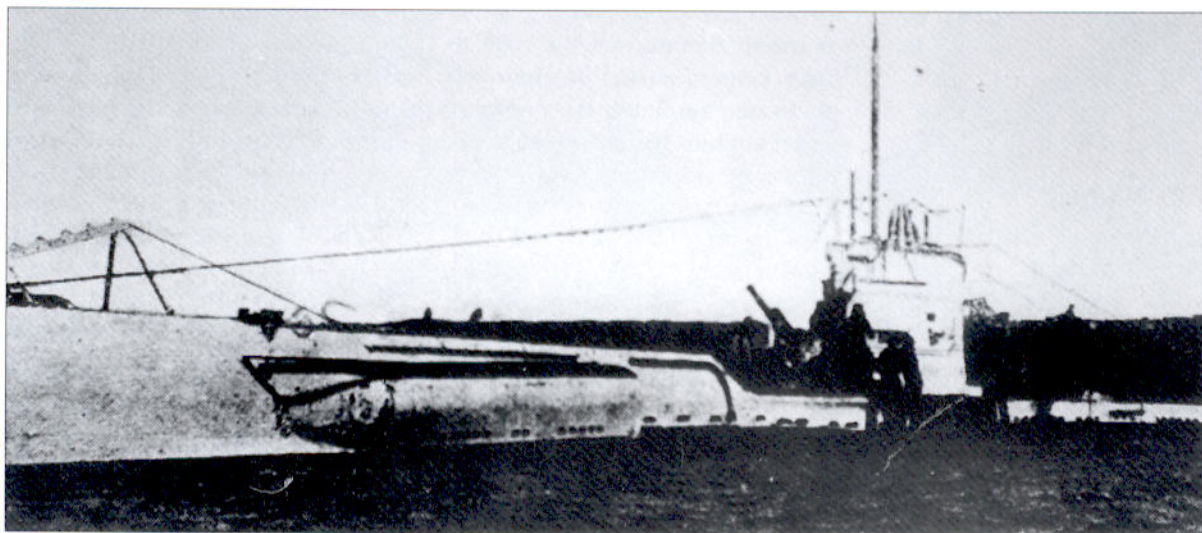
Also put into production around the same time was a design for a small coastal minelaying submarine, based broadly along the same lines as the UB type. Weighing just 150 tons, these boats featured six mine tubes, each carrying two mines. The stowage was wet (with mines stored in flooded compartments), so that there was no access to the mines once the boat was at sea and thus no adjustments to the settings on the mines could be made. These vessels were classed as Type UCI.

In November 1914, the Vulcan yard was contracted to build UC-1 to UC-10 whilst AG Weser constructed UC-11 to UC-15. A small number of larger minelayers were also ordered. At 700 tons each, these vessels featured two torpedo tubes in addition to their minelaying capacity. They were known as Type UE.



UB4, one of the early UBI Class boats. Note the disruptive camouflage pattern that has been applied to her hull and conning tower. These patterns were extremely effective.

UC52, one of the UCII Class mine-laying submarines. Note that the front portion of the foredeck is raised above the level of the gun platform. The bulges along the side of the forward part of the hull are the boat's forward torpedo tubes.



The small coastal UB types had numerous disadvantages not the least of which was the single propeller. Should it be put out of action for any reason, the vessel would be rendered helpless. To counteract these shortcomings, an improved version, the UBII, was ordered in April 1915. These enlarged boats featured twin propellers and increased top speed and range. UB-8 to UB-23, and UB-30 to UB-41, were built by the Blohm & Voss yard, whilst AG Weser contributed UB-24 to UB-29 and UB-42 to UB-47.

As with the UB type, the UC minelayer concept was revisited and a larger 400-ton improved version produced. Each of the six mine tubes in this type could carry three mines, though once again storage was wet. As well as its mine-carrying capacity, this type of vessel featured an 8.8 cm deck gun. This vessel effectively became the first 'mass produced' U-boat with sizeable numbers being produced as follows:

UC-16 to UC-24	Blohm & Voss
UC-25 to UC-33	Vulcan
UC-34 to UC-39	Blohm & Voss
UC-40 to UC-45	Vulcan
UC-46 to UC-48	AG Weser
UC 49 to UC 54	Germaniawerft
UC-55 to UC-60	Kaiserliche Werft
UC-61 to UC-64	AG Weser
UC-65 to UC-73	Blohm & Voss
UC-74 to UC-79	Vulcan

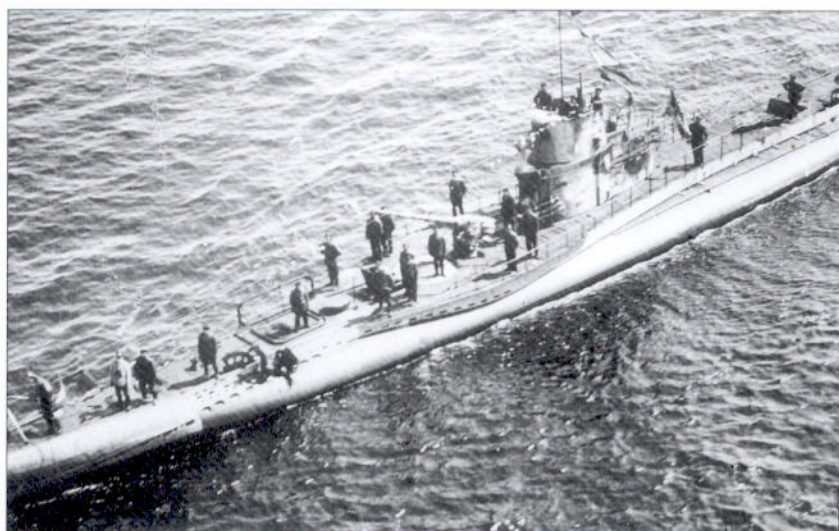
A total of 64 boats of this type were built.

UB-64. One of the improved UBIII Class. These were the largest and most successful of the coastal submarines. Note how the size of this vessel compares with the diminutive UBII Class such as UB-41. The UBIII Class was the basis around which post-war U-boat development would begin, resulting in the highly successful Type VII boats which formed the backbone of the *U-Boot Waffe* in WWII.

THE LARGER U-BOATS

In April 1915, the so-called Project '31', first raised in 1913, was revisited. This required the construction of larger types of ocean-going U-boats to participate in the blockade of the British Isles. These boats were to have a surface speed of around 18.5 knots, with a submerged speed

of 11 knots, powered by 1,500 hp diesel engines and were to be armed with 8.8 cm guns. Development was to have been carried out by Kaiserliche Werft but the outbreak of war had slowed down progress. In June 1915, new proposals were brought forward based on the old Project '31', now to be known as Project '42'. The new boats were to be of 1,200-ton displacement, with an operational range of some 10,000 nautical miles at an optimum 8 knot speed and





**An alternative view of UB-64.
Note the relatively spacious
gun platform.**

were to be armed with two powerful 10.5 cm naval guns. Of these, U-127 to U-130 were to be built by Germaniawerft, U-131 to U-134 to be built by AG Weser, and U-135 to U-138 to be built by Kaiserliche Werft. By January 1916, a total of 186 U-boat keels had been laid.

In May 1916, a new improved version of the UB type was called for, to assist in the blockade of the British Isles. Displacing some 500 tons, armed with four torpedo tubes and an 8.8 cm deck gun, this medium-sized boat was to be known as the Type UBIII. Approval was given, with construction to begin as soon as the current contracts for construction of all UBII and UCII types had been completed. Each of four main contractors was allocated contracts to build six boats, as follows:

UB-48 to UB-53	Blohm & Voss
UB-54 to UB-59	AG Weser
UB-60 to UB-65	Vulcan
UB-66 to UB-71	Germaniawerft

Ultimately, a total of 90 UB type boats were to be built, making it the most common and successful of all the U-boat designs.

Also in May of 1916, plans for a larger, 1,000-ton vessel were approved under Project '45'. As well as being equipped with four torpedo tubes, and with a complement of six torpedoes, these vessels were to have two 10.5 cm guns, and carry 32 mines. They were to have a range of some 6,000 miles at 9 knots. Of this type, U-117 to U-121 were to be built by Vulcan, and U-122 to U-126 by Blohm & Voss.

On 22 September 1916, an improved U-93 type was called for, under Project '43'. The Schichau yard, anxious to gain lucrative U-boat building contracts, offered to produce two boats, U-115 and U-116, at their own expense in order to establish their competence in submarine construction. The offer was readily accepted by the U-boat Inspectorate.

U-105 to U-114 were the so-called Ms boats (*Mobilisierungsplan*) constructed at the Germaniawerft.

THE U-CRUISERS

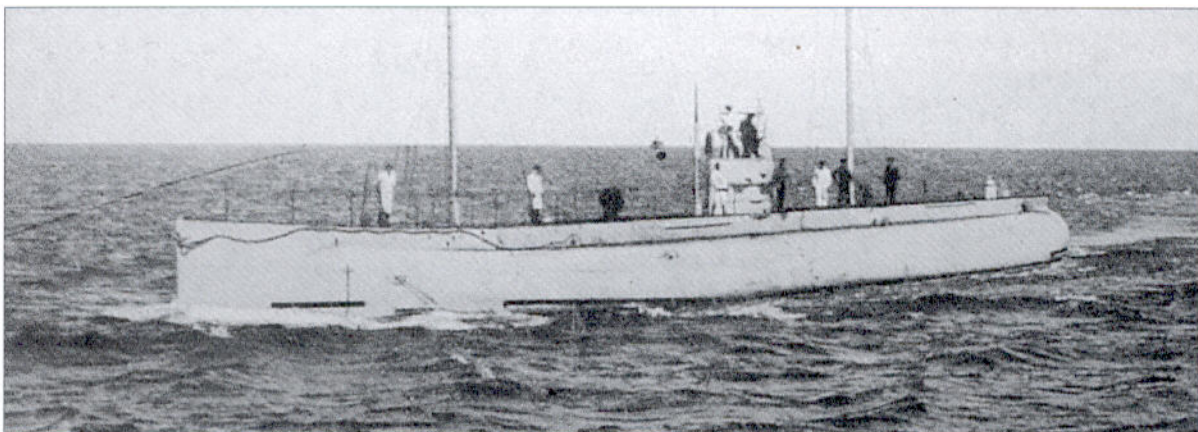
In an effort to break the British blockade of Germany, and bring essential strategic supplies through to the Reich, the idea of manufacturing huge cargo-carrying submarines to supplement the vulnerable surface merchant ships was approved.

The first, and most famous of all, of these was the submarine *Deutschland*, launched at the Flensburger Schiffsbau yard on 28 March 1916. *Deutschland* was extremely successful, and although her purpose was to bring essential war materials through the British blockade, she was initially a commercial vessel, not under naval control. Her legal status thus allowed her to travel between Germany and the USA, bringing home significant amounts of strategic supplies. Her first cruise began on 14 June 1916 when she left Bremen. Skirting around the north of the British Isles, she completed her maiden cruise to Baltimore on the US east coast on 9 July. Under the command of Kapitänleutnant König, she had travelled most of the way on the surface. Taking dyestuffs, a product for which Germany was justly famous in these days, to the US, she returned carrying 350 tons of rubber, 340 tons of nickel and 93 tons of tin. The cruise was a propaganda triumph for Germany.

A second 1,000-ton cargo submarine, the *Bremen*, also set off on a commercial cruise to the US, but was lost en route, the circumstances of her demise being unknown. It is suspected she struck a mine and was lost with all hands.

Deutschland's second cruise to the US, although successful in terms of material brought through the British blockade, was marred by tragedy when she struck a tug when attempting to depart New London in November 1916, causing the death of five of the tug's crew. It was to be

The merchant U-boat *Deutschland* running on the surface. When her merchant days were over, *Deutschland* was taken over by the navy, armed, and renamed as U-155.



her last 'civilian' cruise, as she was handed over to the Kaiserliche Marine in February 1917 for conversion to an armed U-cruiser, becoming U-155.

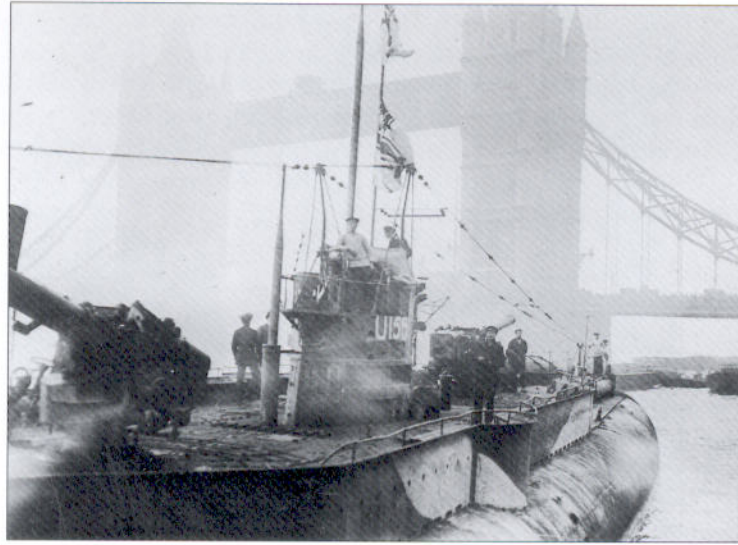
Six further large cargo-carrying submarines had been ordered and were under construction. On 16 December 1916, however, four being constructed by Reicherstieg at Hamburg and Flensburger Schiffsbau were taken over by the navy and changed to military specifications, as U-151 to U-154. The remaining two were taken over by the navy along with *Deutschland* in February 1917. Each vessel had two 15 cm guns added. All except the

former *Deutschland* were also fitted with bow torpedo tubes and a complement of 18 torpedoes. The *Deutschland*, now U-155, was fitted with six tubes, which were fired at a forward angle from the upper deck.

Under Project '46', a range of very large U-cruisers was ordered. These massive vessels, displacing just under 2,000 tons, but with a surface speed of 15 knots, were armed with two 15 cm guns and had a cruising range of some 12,000 miles. They carried prize crews and were intended to intercept and either capture or destroy enemy merchantmen on the surface. Their powerful armament and high speed allowed them to take on even armed merchantmen. Three of this type, U-139 to U-141, were ordered from Germaniawerft in August 1916.

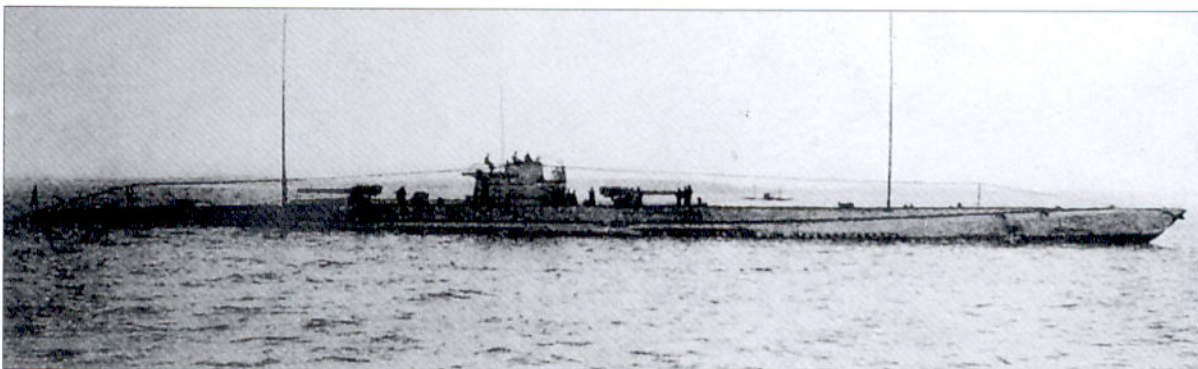
Shortly thereafter, Project '46(a)' called for even more powerfully armed U-cruisers. These displaced 2,000 tons, but had a higher top speed of 18 knots. As well as carrying two 15 cm guns, they had two supplementary 8.8 cm guns. Of this type, U-142 to U-164 were built by Germaniawerft, U-145 to U-147 by Vulcan, and U-148 to U-150 by AG Weser.

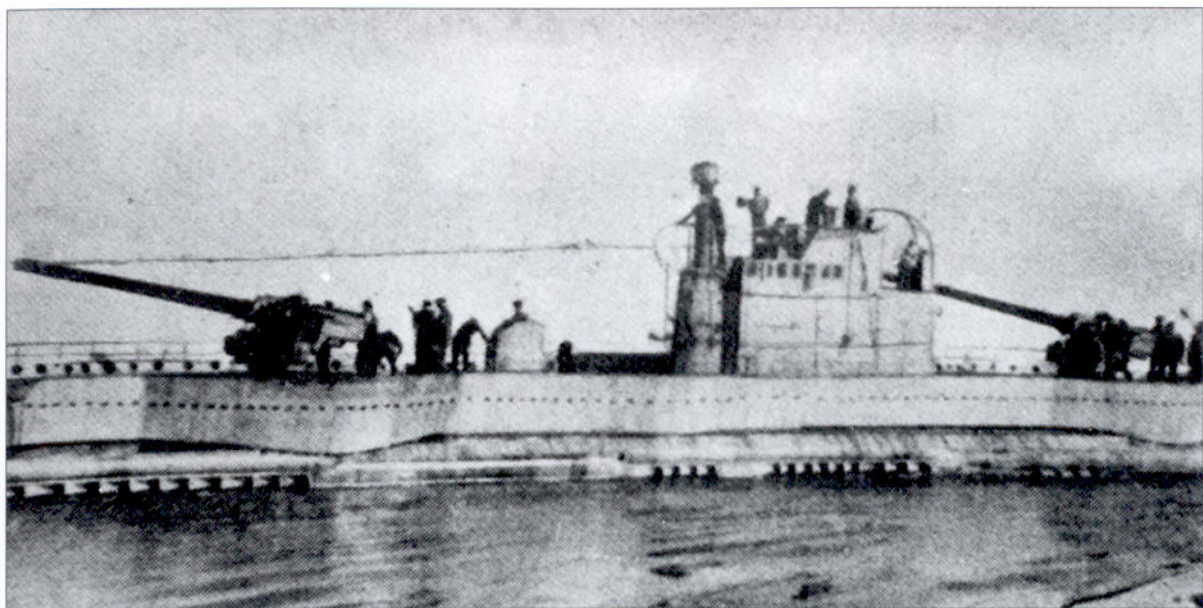
An even larger type was considered under Project '47'. It would have displaced some 2,500 tons, had a top speed of 21 knots, and been armed with four 10.5 cm guns as well as six torpedo tubes, two of which would have fired sideways. This type never reached construction.



U-155, moored in the Thames next to Tower Bridge shortly after the end of World War I. Looking from the bow down towards the stern, the spacious deck and extreme bulk of this large vessel is clear from this shot. Note also the camouflage paint scheme applied to her hull side.

U-139, one of the large U-cruisers, fitted with a formidable deck armament of two 15 cm guns, and capable of taking on enemy surface warships if necessary. This class of boat had a cruising range of over 12,000 nautical miles, bringing operation in American waters within easy grasp.





Another view of U-139 showing just how large her main armament was. These boats were designed with a view to them being able to take on enemy armed merchantmen if necessary, and in most cases would use their deck armament rather than torpedoes to sink enemy merchant ships.

Summary of Wartime Production

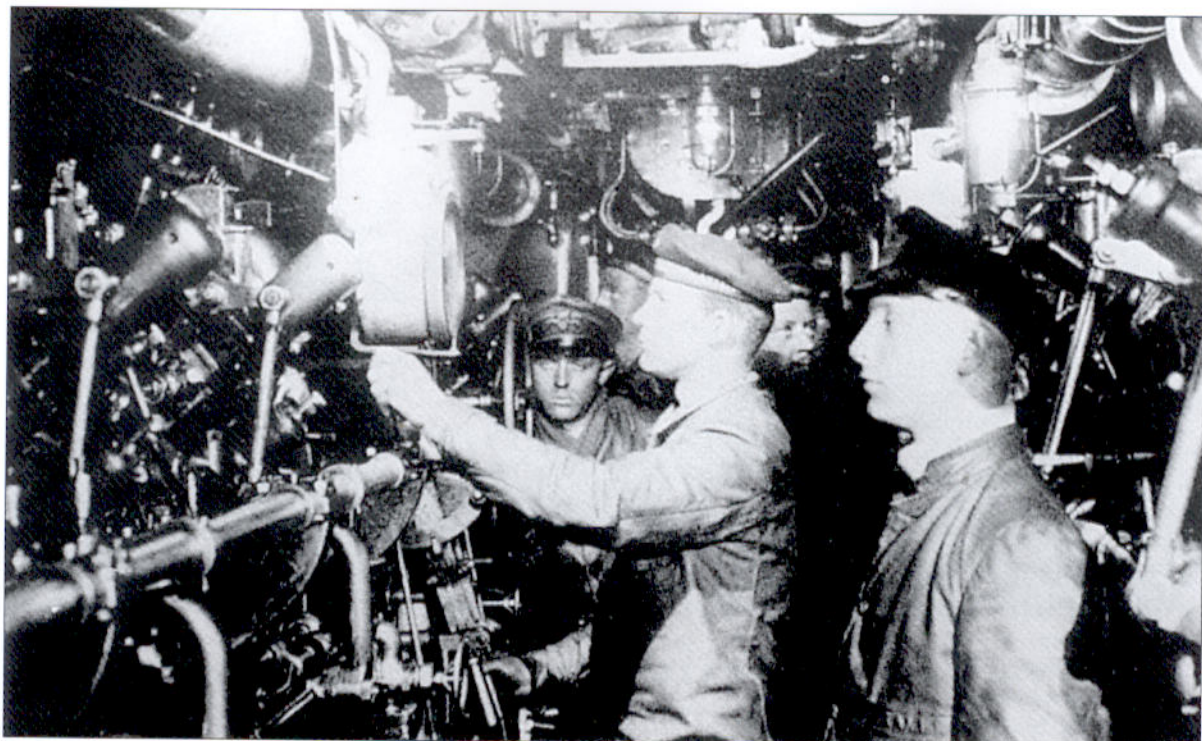
As can be seen in the table below, the most numerous type to be constructed was the larger, improved coastal type UBIII. This boat was of excellent design and was, in fact, the basis for the hugely successful Type VII boat used by the Kriegsmarine.

	1914	1915	1916	1917	1918	<i>Total</i>
U-boats	10	12	25	25	11	83
U-cruisers				7	4	11
UBI class		17				17
UBII class		5	25			30
UBIII class				42	47	89
UCI class		15				15
UCII class			51	13		64
UCIII class					16	16
UE class		3	7		10	20

POWERPLANTS

Körting

Following the decision not to allow the use of petrol-powered engines, the first paraffin engines to be used were developed by Körting Brothers. These were based on a smaller engine used to power small surface speedboats, but enlarged to produce first a six-cylinder engine capable of 250 hp, then later an eight-cylinder engine capable of 350 hp. One such engine powered each shaft, along with a 200 hp electric motor to power the shaft when the vessel was submerged. In order to increase the power available to the larger boats, in U-17 and U-18, two eight-cylinder, 350-hp engines were connected to each shaft, as well as two 560 hp electric motors. These boats, however, still struggled to reach the wished-for 15 knot surface speed.



MAN

Maschinenfabrik Augsburg-Nurnberg produced the first useable four-stroke diesel-powered submarine engine to be installed in a German U-boat. These engines developed 850 hp and were installed in U-19 and U-22, with one engine coupled to each shaft. Back-up was provided by two 600 hp electric motors. MAN subsequently developed enlarged versions of these engines developing first 1,000 hp, then 1,200 hp and ultimately 1,750 hp. These engines, though superior to the two-stroke Germaniawerft models, were not without their problems. The crankshaft for the MAN engines had a total of six fittings. This resulted in a shaft which was not particularly well balanced and which suffered from torsion-resonance, something which could be satisfactorily cured only by using heavier shafts. These engines were also known to experience occasional problems starting or when being put into reverse. Nevertheless, they remained a better product than the Germaniawerft two-stroke diesels.

The MAN diesels were not the first such engines to be installed in a German-built submarine. The *Atropo*, built by Krupp in 1911 for the Italians, was powered by two 350 hp Krupp-built two-stroke diesel engines. MAN engines were, however, the first diesels to be installed in a submarine specifically built for the German Navy.

Germaniawerft

Krupp's Germaniawerft operation vainly struggled for a significant length of time, several years, to produce a two-stroke diesel engine efficient and powerful enough to propel a U-boat in active service conditions. U-23 to U-26 were the first to be powered by Germaniawerft engines, each developing 900 hp. A small increase in power was

An interior shot showing the diesel engine room in a U-boat. Only a narrow passageway existed between the two parallel diesel motors. The poor lighting, noise, smell and heat in this room could be overpowering.

achieved by opening the cylinder bores slightly to produce a 925 hp engine for U-31 to U-41. Subsequent Germaniawerft engines provided up to 1,150 hp, but these remained second best to the MAN design, requiring far more fuel, and being much heavier.

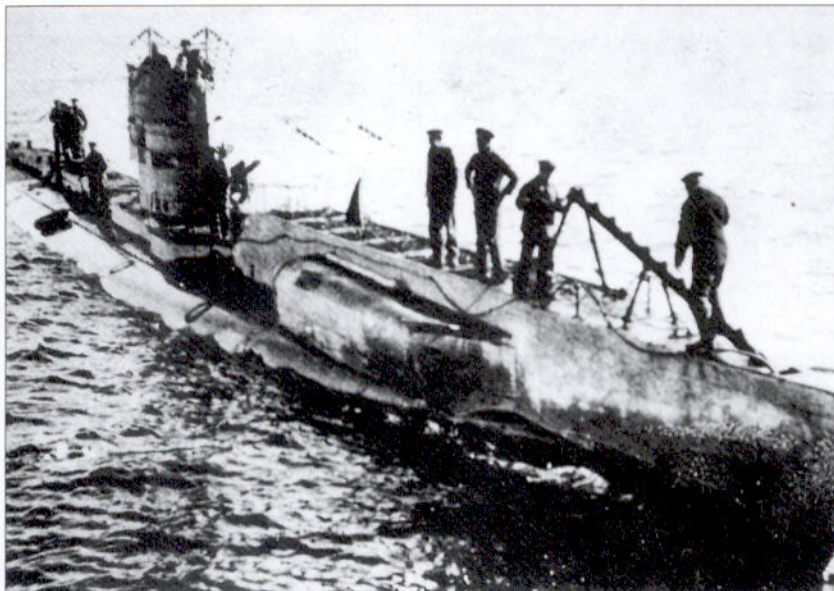
Electric Motors

Due to the inability to provide an intake of air for the combustible fuel/air mix, or to expel noxious exhaust gases, only electric motors were, at that time, suitable for providing underwater propulsion for submarines. This would remain true for many years to come.

Early boats featured small motors capable of only some 200 hp. This reduced the power available and, together with the increased drag factors when moving underwater, resulted in a considerable decrease in maximum speed. Later boats would be given larger motors capable of developing 400, 450, 600 and as much as 845 hp in some of the largest U-cruisers. Some of the later U-boats were also fitted with separate generators for recharging the boat's batteries. Problems with the more powerful electric motors were that they required much larger battery capacity, taking up large amounts of space in the confines of the submarine, and adding large amounts of weight to the final displacement, not to say a huge chunk of the overall cost of the boat.

Even the larger batteries had only limited capacity without being recharged so that, coupled with the limited air supply, this conspired to greatly restrict the time a submarine could remain submerged at any one time. This was not, in the early days of submarine warfare at least, too much of a problem. Anti-submarine measures were so primitive and ineffective that running on the surface to recharge batteries from the main engines could often be accomplished with little danger to the boat.

Batteries, however, created a danger if a submarine developed serious leaks. Were water to encroach into the battery compartments, the resultant chemical reaction between the water and the acid in the batteries would create deadly chlorine gas.



UC-79, a UCII Class minelayer. This photo shows to good advantage the raised forward deck containing the mine tubes. UC-34 to UC-39 had a distinctive rounded bow, whilst later boats such as UC-79 had a sharply raked bow.

Closed Circuit Systems

All of the German submarines in the time period with which we are concerned had dual power plants, one (diesel or paraffin) to power the boat when on the surface and one (electric) to power the boat when submerged. Some experimentation was done in the field of closed-circuit engines. The Deutz engine firm had produced an experimental engine that utilised a mixture of nitrogen dioxide and exhaust gases from the standard paraffin engines that, when fed into a combustion chamber, provided the explosive mixture required in an internal combustion engine. A serious explosion during testing, however, brought the experiments to a rapid end.

Proposals were also drawn up for a closed-circuit steam engine based on earlier experiments done by German engineer Moritz Honigman, whereby exhaust steam from a basic steam engine was passed through a caustic soda solution in a boiler tank fitted with a water jacket. The reaction caused the caustic solution to heat up, in turn heating up the water in the boiler's water jacket and producing more fresh steam to power the engine. Although the basic prospect looked viable, the outbreak of war brought any attempts to introduce such an engine to an end.

STEERING

From U-1 through to U-22, all U-boats had the rudder placed ahead of the propeller blades. Thereafter, a more conventional arrangement with the rudder placed astern of the propellers was used.

WEAPONS

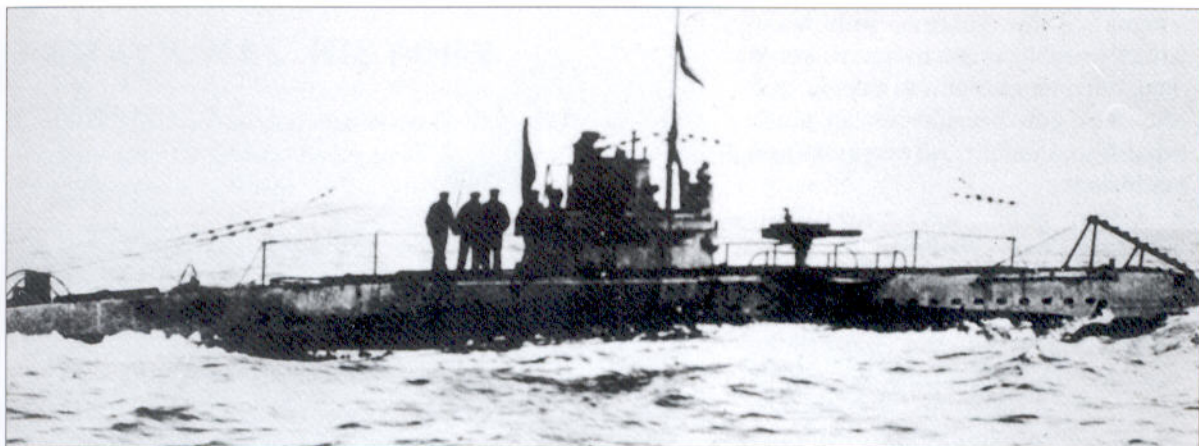
Torpedoes

Three main sizes of torpedo were used on German submarines in the Kaiser's Navy. Initial development made use of an existing design of which large stocks were on hand for use by surface vessels such as torpedo boats. This was the C35/91. Some 35.5 cm in diameter and 4.75 m in length, it was powered by a three-cylinder motor which gave it a top speed of around 27 knots. The warhead contained some 40 kilos of explosive.

A subsequent development, the C45/91, was increased to 45 cm in diameter and 5.1 m in length. Similarly powered, it too – and indeed all other torpedoes which followed – had a top speed of some 27 knots, and was built with three different warhead sizes, 87.5 kilos, 129 kilos and 141 kilos, making it a far more deadly weapon than its predecessor.

A surface vessel supplies fresh torpedoes to a U-boat at sea. Loading fresh torpedoes was an awkward and laborious business, difficult to achieve in anything but the flat calm seas seen here. The boat being resupplied here is U-35.





UB-41, one of the UBII Class coastal submarines. The diminutive size of these small coastal boats is clear from the size of the crew members relative to the vessel. On the foredeck is a 5 cm gun.

The C/03D, similar to the C45/91, was slightly longer at 5.65 m and featured a slightly larger warhead at 148 kilos. The C/06 and C/06D, both outwardly similar to the C/03, featured a slightly smaller warhead, at just 122 kilos. The 'D' variant was provided with a four- rather than three-cylinder engine.

The next major development was the 'G' series of torpedoes, all larger again at 50 cm in diameter. The G6 and its sub-variant, the G6D, were both of 6 m in length with a four-cylinder engine and a substantial 160 kilo warhead.

The final and most significant development was the G7. The longest of all at 7 m, it featured a large 195 kilo warhead. It was this torpedo which would ultimately develop into the G7e used so widely by the Kriegsmarine U-boats of the Second World War.

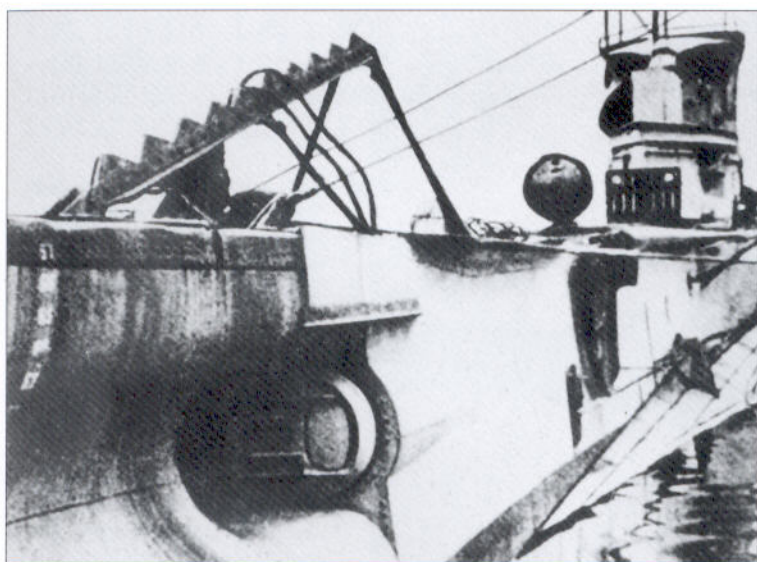
U-79, a UEI Class minesweeper. Clearly visible here are the port forward torpedo tube door and the net cutter. An 8.8 cm gun was fitted on the after deck.

Deck Guns

Initially, the most common armament fitted to U-boats was the extremely successful and adaptable 8.8 cm gun. Some smaller boats were fitted with a 5 cm gun or even a simple 8 mm machine gun, but the 8.8 cm was by

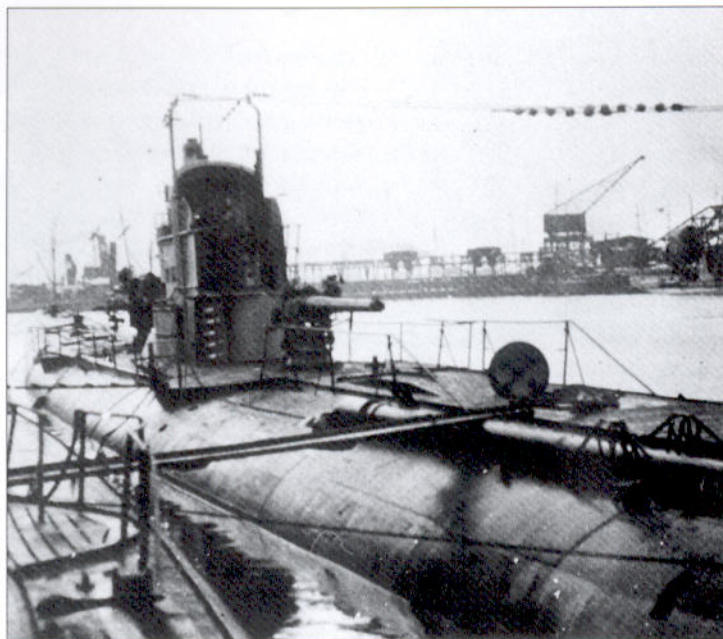
far the most common of all U-boat guns. As the size of the average U-boat grew, a number were fitted with 10.5 cm guns and the ultimate was reached when 15 cm guns were fitted to the larger U-cruisers. These were basically the equivalent of the 6-inch naval gun fitted to medium-sized warships such as cruisers.

Mounting such heavy guns on a U-boat may seem out of place but it should be remembered that the Kaiser's U-boats, though facing many dangers, did not have to contend with the advanced anti-submarine measures faced by their successors in the Kriegsmarine. However, attempting to face the



enemy on the surface, with aerial attack possible at any moment, would have been tantamount to suicide, and the deck gun became just so much superfluous weight and dragged when underwater.

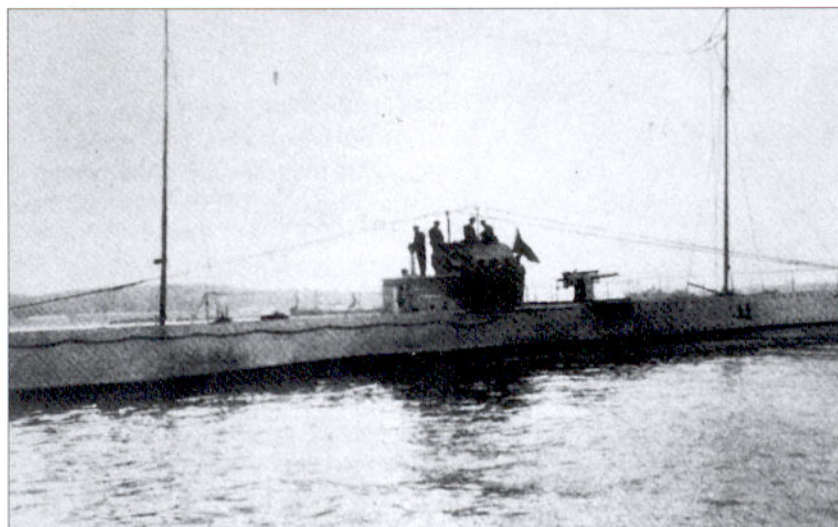
Deck guns were eventually removed from virtually all active U-boats whilst light anti-aircraft weaponry was increased. For the U-boat crews of the Kaiserliche Marine, however, engaging enemy ships by gunfire on the surface remained a viable option to the use of extremely expensive torpedoes for much of the war. Weapons like the 10.5 cm and 15 cm gave the U-boat an opportunity to engage many enemy ships from well beyond the range of the target's armament.



OPTICS AND OTHER EQUIPMENT

German U-boats were blessed with some of the finest optical equipment in existence, though the periscopes fitted to early U-boats were crude in comparison to later models. The scope tube itself on many early vessels was extremely short at around a mere 4.5 m. This meant that a U-boat coming to periscope depth in anything but a moderate swell would run the risk of detection as its upper surfaces became exposed. From U-43 onwards, 7.5 m scopes were fitted, which meant that a boat could safely move at periscope depth without the risk of being seen. Two scopes were fitted, one for general observation and one, its eyepiece in the commander's attack position, for attack purposes.

U-90, a medium size sea-going U-boat, viewed from astern. These boats, initially fitted with two 8.8 cm guns, ultimately had them removed and replaced by a single 10.5 cm gun. In this shot, it appears the after 8.8 cm gun still remains. The larger, dark bulk of the 10.5 cm forward gun can be seen just ahead of the conning tower.



U-80, another UEI Class vessel. The elaborate system of radio antennae and rigging wires for the masts can be seen to good effect here. The strange configuration of conning tower and deck gun positions might initially give the impression that the bow would be to the right of this photograph. In fact the gun is on the after deck, and the crewman at left on the conning tower is standing by the ship's wheel, the bows being just out of shot to the left.

OPERATIONAL HISTORY

The U-boat arm was divided operationally into six home flotillas and five flotillas outside Germany. At its peak in 1918, the home flotillas and their boats were as follows:

Unterseebootsflotille 1

Commanded by Korvettenkapitän Pasquay
U-71, U-78, U-79, U-80, U-118, U-119, UC-17,
UC-31, UC-40, UC-45, UC-49, UC-58, UC-59,
UC-71, UC-76, UB-21, UB-34, UB-67, UB-73,
UB-77, UB-98, UB-99, UB-127, UB-130, UB-132

Unterseebootsflotille 2

Commanded by Kapitänleutnant von
Rosenberg Grusyczynski
U-52, U-53, U-54, U-55, U-57, U-60, U-61, U-62,
U-100, U-102, U-103, U-104, UB-62, UB-64,
UB-65, UB-72, UB-80, UB-88, UB-89, UB-90,
UB-91, UB-92, UB-93, UB-94, UB-95, UB-96,
UB-97, UB-111, UB-117

Unterseebootsflotille 3

Commanded by Kapitänleutnant Walther
Forstmann
U-19, U-21, U-22, U-43, U-46, U-89, U-90,
U-91, U-92, U-135, U-136, UB-83, UB-86,
UB-87, UB-112, UB-116, UB-118, UB-119,
UB-120, UB-121, UB-122, UB-123, UB-124,
UB-125, UB-126

Unterseebootsflotille 4

Commanded by Korvettenkapitän Prause
U-67, U-70, U-82, U-84, U-86, U-93, U-94, U-95,
U-96, U-97, U-98, U-105, U-107, U-108, U-109,
U-110, U-111, U-113, U-114, U-160, U-161,
U-162, U-163, U-164, U-165

Unterseebootsflotille 5

Commanded by Korvettenkapitän Jürist
UB-21, UB-22, UB-34, UB-62, UB-63, UB-64,
UB-65, UB-67, UB-72, UB-73, UB-74, UB-77,
UB-78, UB-82, UB-83, UB-85, UB-86, UB-87

Unterseekreuzer Flotille

Commanded by Fregattenkapitän Koch
U-35, U-38, U-62, U-91, U-117, U-139, U-140,
U-141, U-151, U-152, U-153, U-154, U-155,
U-156, U-157

Flotillas based outwith Germany were as follows:

Unterseebootsflotille Flandern 1

Commanded by Kapitänleutnant Walther
UB-21, UB-54, UB-55, UB-57, UB-58, UB-59,
UB-74, UB-78, UB-80, UB-88, UB-103, UB-108,
UB-109, UB-115, UB-116, UB-117, UC-4,
UC-11, UC-17, UC-40, UC-50, UC-56, UC-77,
UC-78, UC-79

Unterseebootsflotille Flandern 2

Commanded by Kapitänleutnant Rohrbeck
UB-10, UB-12, UB-16, UB-17, UB-30, UB-31,
UB-33, UB-34, UB-35, UB-38, UB-40, UB-104,
UB-107, UB-110, UB-111, UB-112, UB-113,
UC-31, UC-48, UC-49, UC-64, UC-70, UC-71,
UC-75

Unterseebootsflotille Mittelmeer 1

Commanded by Korvettenkapitän
Otto Schultze
U-32, U-33, U-34, U-35, U-38, U-39, U-47, U-63,
U-64, U-65, UB-52, UB-53, UB-68, UB-69,
UB-70, UB-71, UB-105, UB-128, UB-129,
UC-20, UC-73

Unterseebootsflotille Mittelmeer 2

Commanded by Korvettenkapitän Ackermann
U-72, U-73, UB-48, UB-49, UB-50, UB-51,
UC-22, UC-25, UC-27, UC-34, UC-35, UC-37,
UC-52, UC-53, UC-54, UC-67, UC-74

Unterseebootshalbflotille

Konstantinopel

Commanded by Kapitänleutnant Krueger
UB-14, UB-42, UB-66, UC-23, UC-37

1914

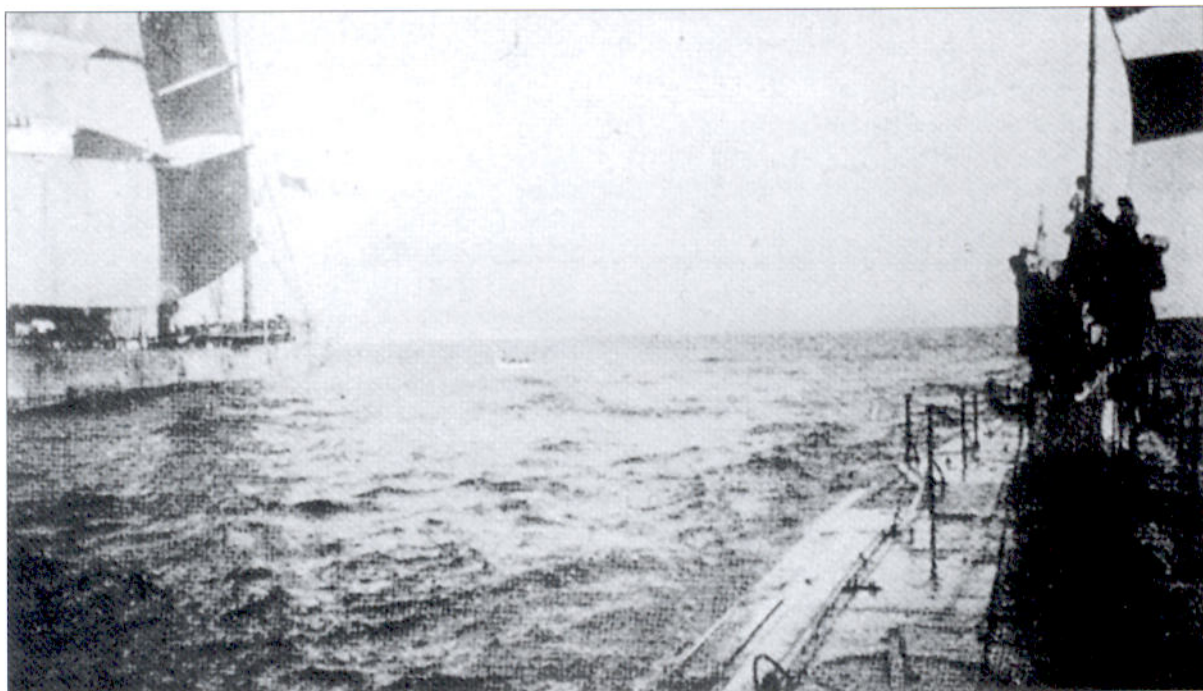
At the outbreak of war, the navy had a mere 28 U-boats in commission, with a further 16 under construction. Four of the 28 available (U-1 to U-4) were not suitable for combat operations and were relegated to training duties, and a further four were undergoing refits, leaving just 20 boats available for active service. At least half of these were older, paraffin-burning boats whose presence was difficult to conceal from the enemy unless they were submerged, due to the clouds of dense smoke created by their power plants. For many in the higher echelons of the Imperial Navy, however, this was not considered problematic, as so little faith was held for the submarines that little was expected of them.

War for the U-boats began on 6 August 1914 when the first war patrol commenced. It was not a particularly auspicious beginning, however. A total of ten boats was sent out on this first sweep. One suffered engine problems and had to turn back, one (U-13) was lost without trace and seven others completed their patrol without engaging the enemy. Only one, U-15, made contact with the enemy when she encountered a British cruiser squadron. Unfortunately for her crew, she was spotted by the enemy and U-13 was subsequently rammed and sunk by the cruiser HMS *Birmingham*.

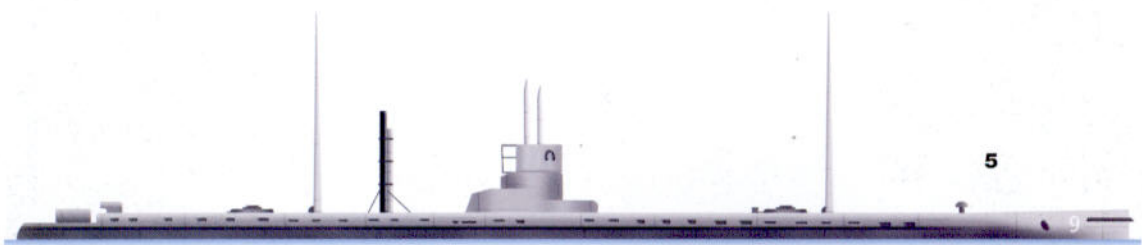
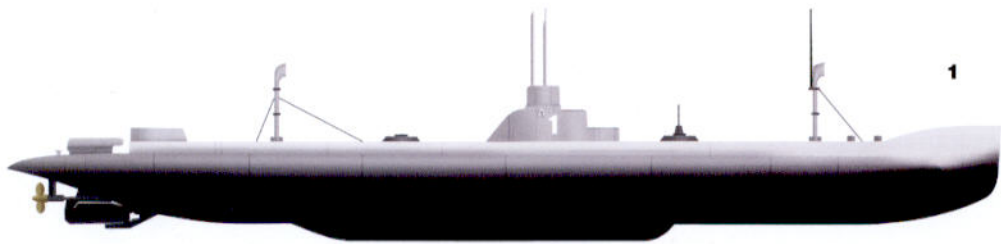
A second patrol sweep into the Straits of Dover fared little better. Only four boats took part on this occasion, but of these, three suffered severe engine problems, highlighting once again the lack of reliability of the early diesel engines. Only one boat succeeded in reaching her patrol area but made no contact with the enemy.

The third cruise of the war took place when a patrol line of three boats was dispatched to the waters between Scotland and Norway, again with a total lack of success, no enemy being encountered.

As daylight fades, U-38, under the command of 'Ace' Max Valentiner, encounters a new victim. Pulling alongside, she orders the crew of the merchant vessel to abandon their ship.



A: Pre-war U-Boats

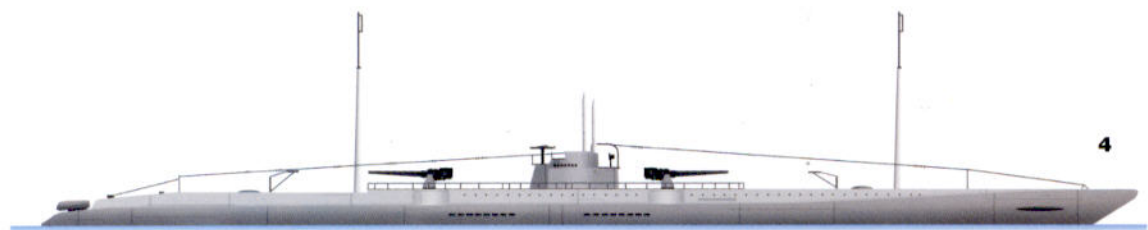
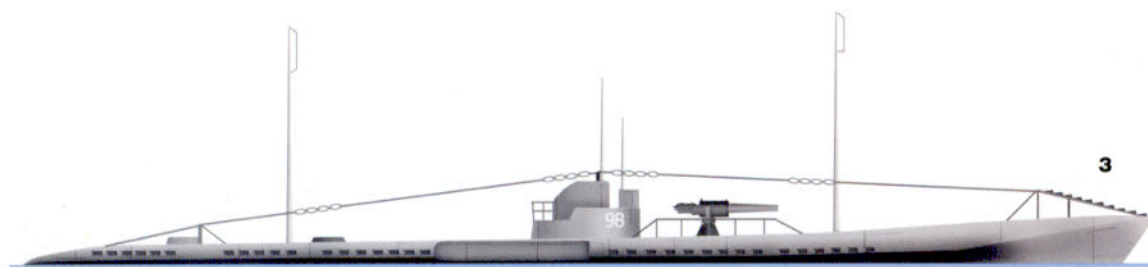
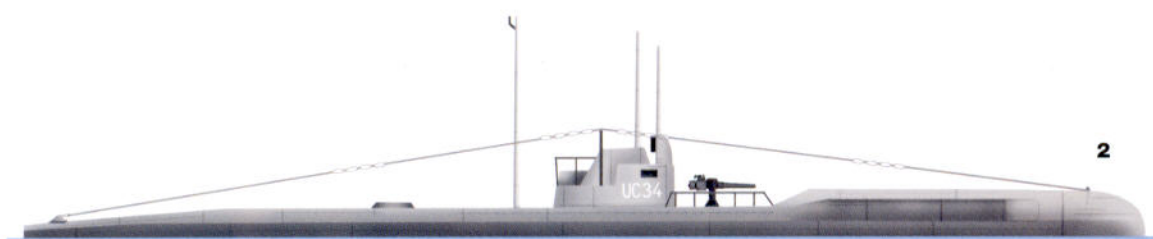




B

B: Surface attack

C: UC-15, UC-34, UC-98 and UC-140



D: TYPE UBIII

SPECIFICATION

Length: 55.3 m

Beam: 5.8 m

Draught: 3.7 m

Displacement: 516 tons

Speed:

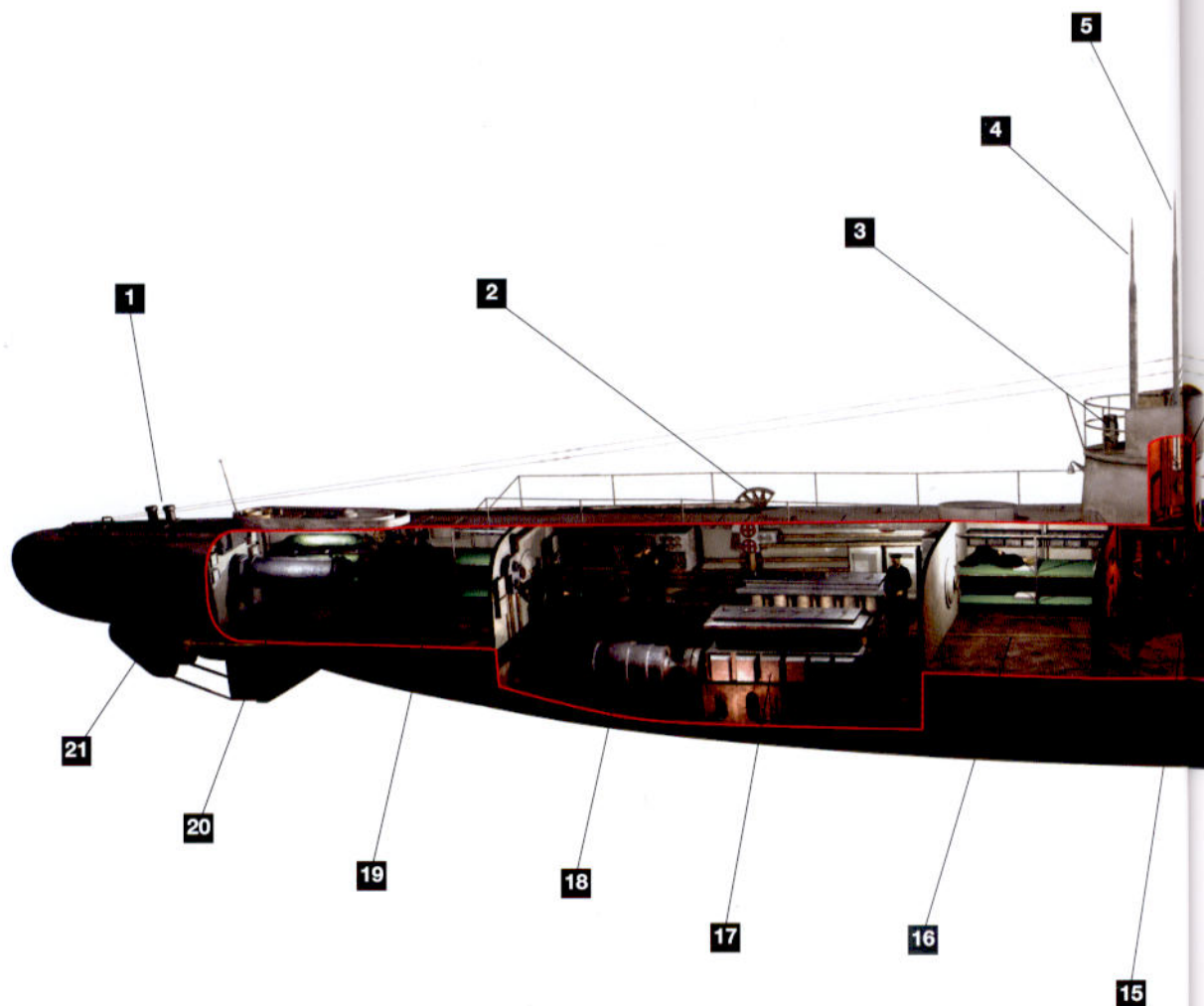
Surfaced: 13.6 knots

Submerged: 8.0 knots

Range: 8,500 nautical miles

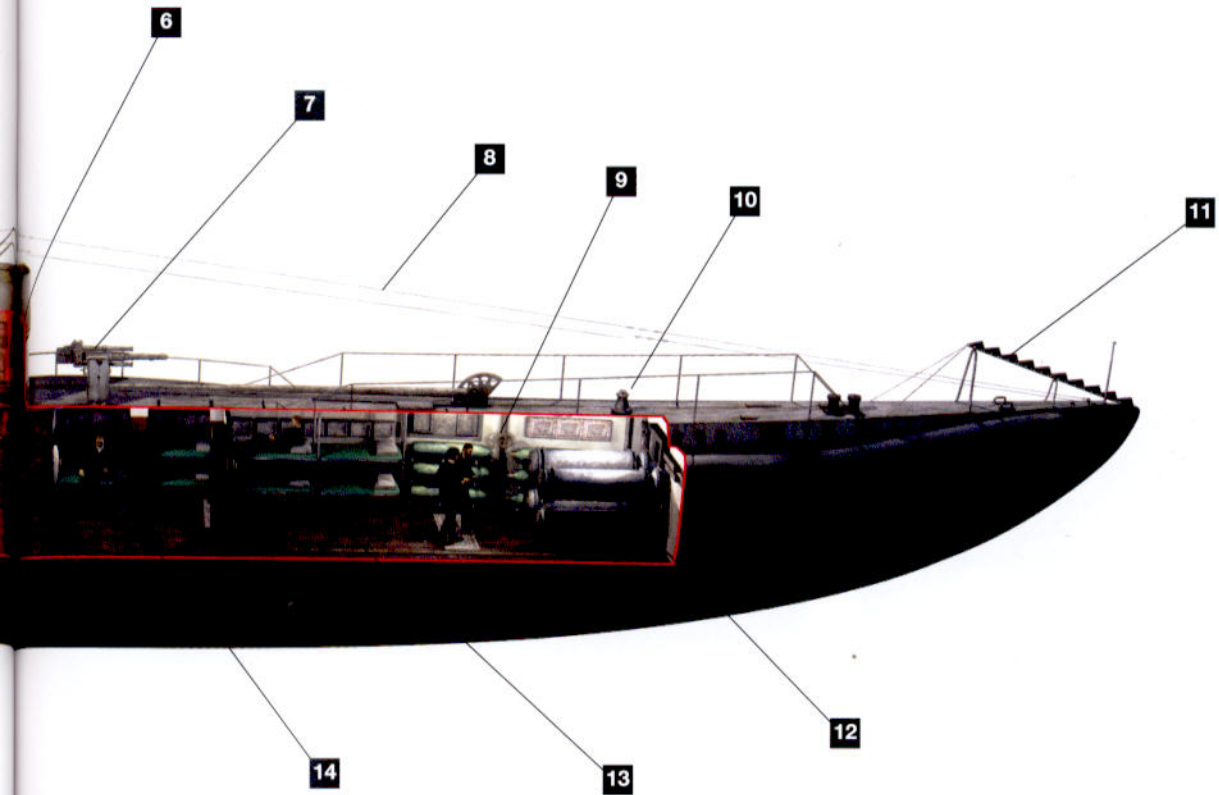
Crew: 34

Armament: 10 x 50 cm torpedoes
1 x 8.8 cm gun

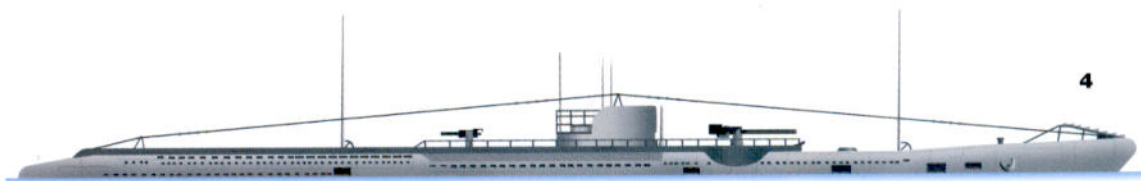
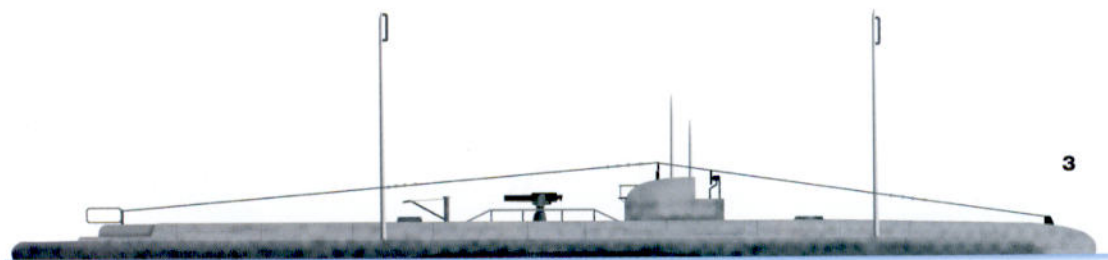
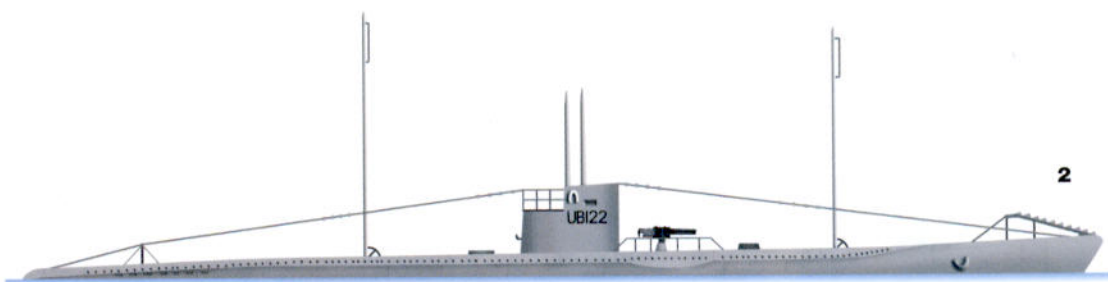
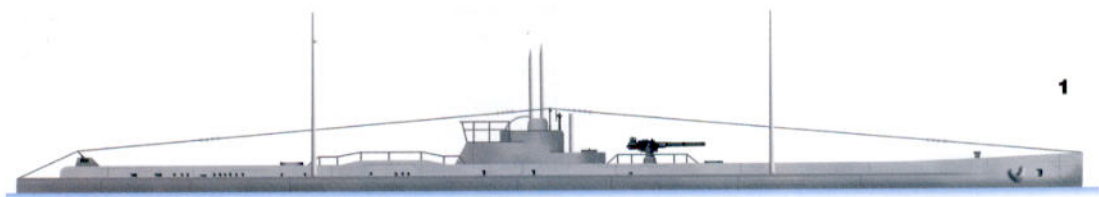


KEY

1. Bollards
2. Folding mast
3. Conning tower
4. Navigating periscope
5. Attack periscope
6. Commander's attack position
7. 8.8 cm deck gun
8. Antennae cables
9. Forward torpedo room
10. Capstan
11. Net cutter
12. Torpedo tubes
13. Lower ratings accommodation
14. Warrant officer and officer accommodation
15. Control room
16. Petty officer accommodation
17. Diesel engine
18. Electro motor
19. Aft torpedo room
20. Stern torpedo tube
21. Rudder



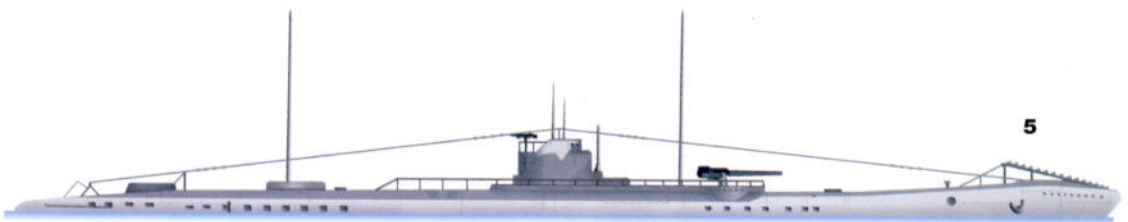
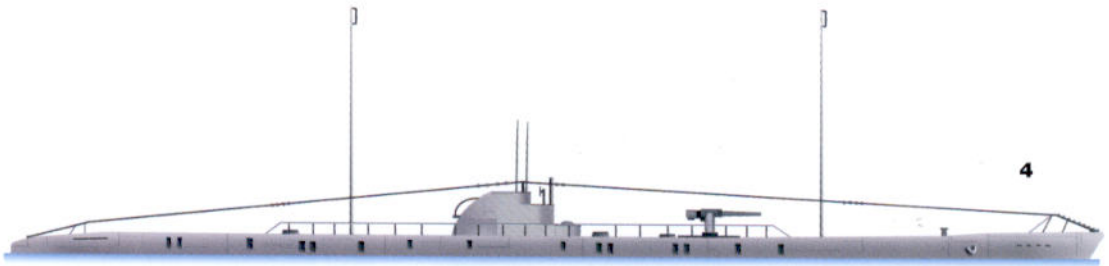
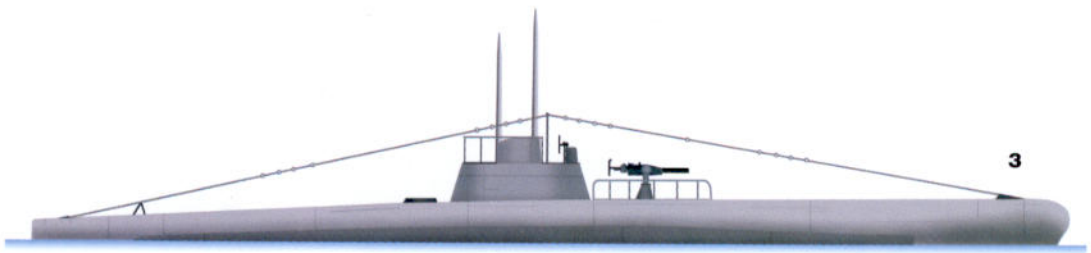
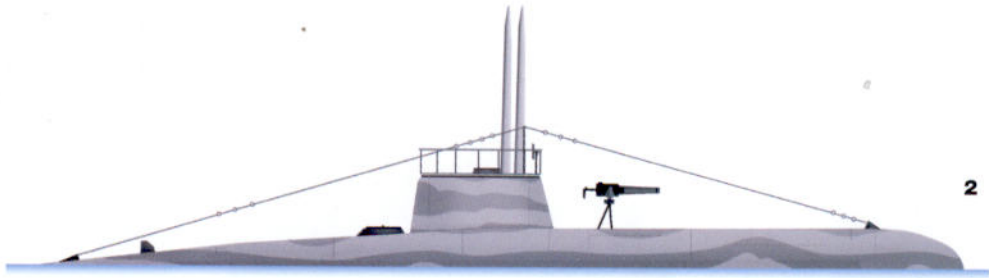
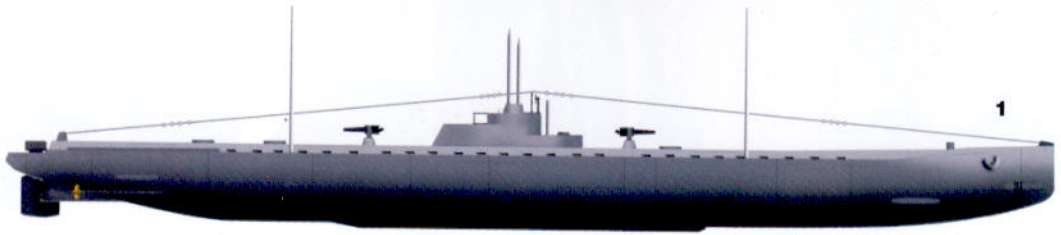
E: U-35, UB-122, U-78 and U-122

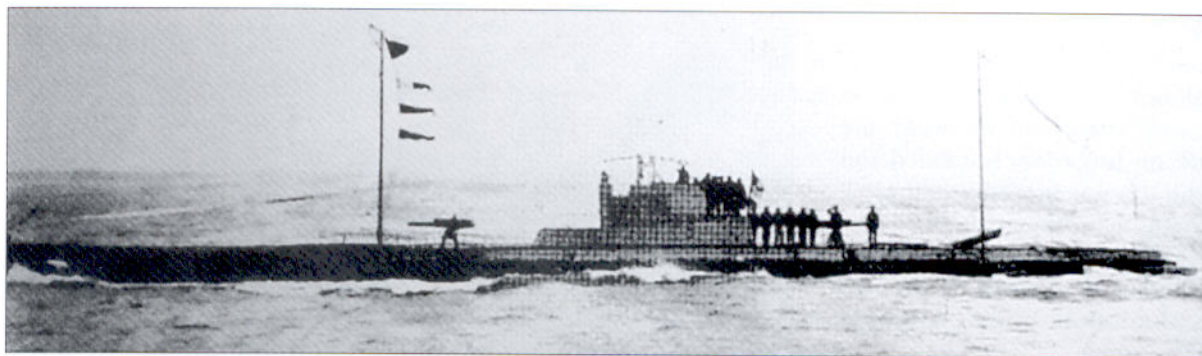




F: Type UBIII

G: U-25, UB-39, U-161 and U-135





It must have seemed to some that those in the anti-U-boat lobby who, like Tirpitz, had once insisted that 'Germany has no need of submarines' might be proven right. Events were about to take a dramatic turn for the young *U-Bootwaffe*, however, presaged by a spectacular success scored by Leutnant zur See Otto Hersing on 3 September 1914.

Hersing, in command of U-21, encountered the British cruiser HMS *Pathfinder*. Carefully positioning his U-boat he launched a single torpedo. As fate would have it, the torpedo struck *Pathfinder* just by her magazine and the resultant explosion destroyed the ship. It was a historic event, the first destruction of a modern warship by submarine attack.

This was followed by another success, so dramatic that it finally convinced the world that the submarine was truly a weapon to be reckoned with. On 22 September 1914, Kapitänleutnant Otto Weddigen was on patrol in U-9, one of the smaller, early U-boats. His tiny boat being battered by heavy seas, he had decided to escape the storm and spent the night on the sea bed. This, of course, all but drained his boat's batteries and in the calm seas of the following morning, he was moving along on the surface charging his batteries when three enemy warships were spotted. Taking U-9 below, Weddigen positioned his boat for an almost point-blank shot, at a distance of only 500 metres, with a single torpedo. The light cruiser HMS *Aboukir* suffered a direct hit and quickly sank. Both the *Aboukir's* crew and those on the two cruisers accompanying her assumed she had struck a mine. Believing that there were no enemy ships in the vicinity, they stopped to pick up survivors. Below the surface, Weddigen's crew toiled to reload the empty bow tube before launching two torpedoes at HMS *Hogue*. Even in later, more advanced submarines, the sudden loss of weight from the launch of two torpedoes could seriously affect the boat's trim. On a more primitive early boat such as U-9, which, at periscope depth, was barely below the surface, the effect was chaotic and U-9 broke the surface. If any doubt remained in the mind of the enemy as to the cause of the *Aboukir's* sinking, it was swiftly removed and both *Hogue* and the third cruiser, HMS *Cressy*, opened fire on the diminutive U-boat just as the two torpedoes struck home, mortally wounding the *Hogue*.

Weddigen slipped below the surface once again, but was in a precarious position himself, with the remaining enemy cruiser aware of his presence and his batteries still not fully charged. His crew struggled to load their final remaining forward torpedo into one of the tubes as he turned his rear towards the enemy and prepared to attack *Cressy* with his stern tubes. Awake to the danger, *Cressy's* crew spotted the torpedoes

U-21, one of the first diesel-engined boats, powered by an 850bhp MAN diesel. These engines were far from perfect but were a vast improvement over the older paraffin-burning power units.

as they streaked towards her, but Weddigen was too close to allow them time to manoeuvre. *Cressy* attempted to avoid the deadly torpedoes but failed and she too was mortally wounded. Weddigen then calmly administered the *coup de grâce* to *Cressy* with his final torpedo and, his ammunition gone, departed the scene.

Weddigen had destroyed over 36,000 tons of enemy warships in a mere few minutes. Germany was ecstatic and a grateful Kaiser decorated the entire crew with the Iron Cross

Second Class and Weddigen with the First Class. Britain at first tried to maintain the ships had been lost to mines but finally admitted that three proud and powerful cruisers had been sunk by a single 500-ton submarine.

Meanwhile, the British maritime blockade was having a serious effect. The entire North Sea had been declared a military zone by the British so no neutral shipping could approach the European mainland from the north. All neutral shipping therefore had to approach via the narrow confines of the English Channel, where they were regularly stopped and checked for contraband (i.e. supplies intended either directly or indirectly through a third party for Germany). Extensive minefields were laid restricting the area through which shipping could safely pass to an absolute minimum and making it easy for any shipping movements to be detected by British patrols.

Nevertheless, successes continued to mount, albeit slowly, for the U-boats. On 11 October 1914, U-26 under Kapitänleutnant von Berckheim sank the Russian cruiser *Pallada*. Otto Weddigen then struck again on 13 October 1914 when he added yet another cruiser, HMS *Hawke*, to his score sheet.

The Royal Navy was by now in something of a panic, and the Home Fleet anchorage at Scapa Flow was evacuated until such time as sufficiently effective anti-submarine defences could be installed.

On 18 October, another historical first was claimed by Germany, when U-27 under Kapitänleutnant Wegener sank the British submarine E-3, the first ever submarine vs. submarine sinking. Two days later another event for the history books occurred when U-17 intercepted and sank the freighter *Glitra* after first ensuring that her crew was safely evacuated. This was the first sinking of a merchant ship by submarine.

The following month was less successful for Germany. In November, U-18 became entangled in anti-submarine nets in Lerwick harbour and was rammed and sunk after being forced to the surface. On 9 December, U-11 was sunk after hitting a mine in the Straits of Dover, and five days later U-5 suffered the same fate when she struck a mine in the English Channel.

By the end of this first year of the war, Germany had lost a total of five U-boats at sea, but considering the astonishing and spectacular successes



A patriotic postcard printed to celebrate the sinking of the cruisers *Aboukir*, *Hogue* and *Cressy* by Kapitänleutnant Weddigen in U-9. Although of course highly stylised, it does show the delight and pride felt in this tremendous achievement by the infant U-Bootwaffe.

scored by her tiny submarine force, Germany could be well satisfied. For those who had campaigned for the submarine as a potential war-winning weapon, their faith in the often reviled U-boat had been fully vindicated.

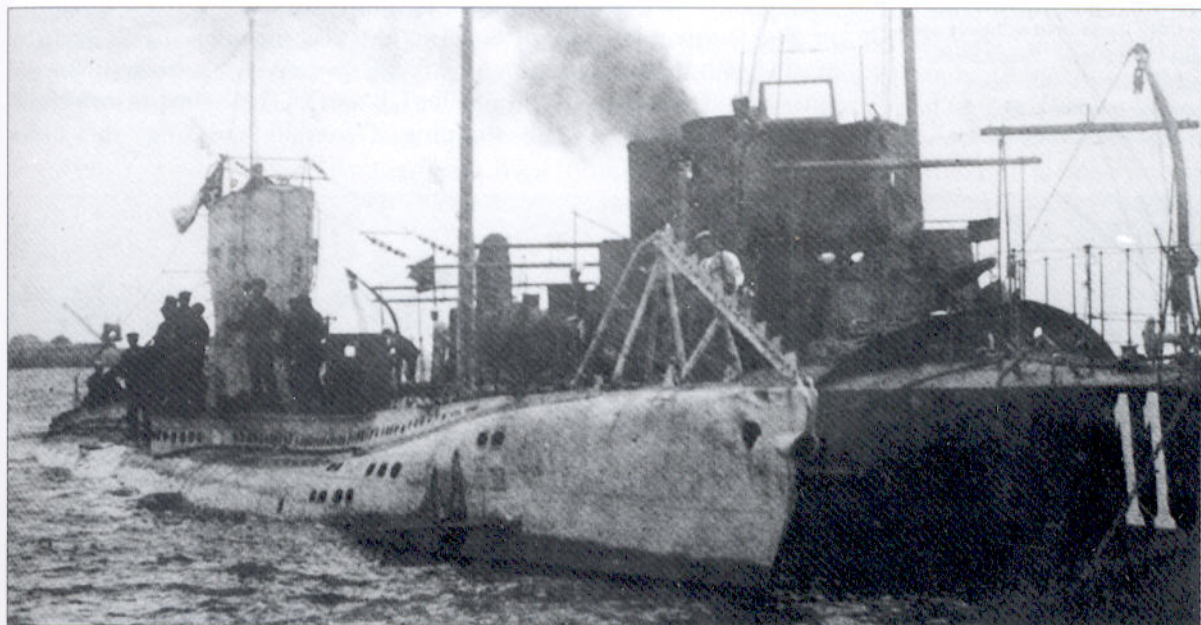
1915

On 1 January 1915, the new year brought its first major success as a British battle squadron patrolling the English Channel was spotted by U-24. The British, rather naively assuming that no enemy forces would be present in the area, had sent out the heavy warships with no destroyer escorts. It was to be a costly mistake. U-24 had assumed that it had lost its chance when, struggling against the heavy seas, it was unable to catch up with the enemy vessels. Its commander was astonished to note, shortly afterwards, the enemy ships heading straight back towards him as they carried out the return leg of their patrol sweep. Positioning himself for an optimum shot, the commander of U-24 launched two torpedoes from his forward tubes, scoring a direct hit and sinking HMS *Formidable*.

The British reaction was predictable. More anti-submarine nets, more extensive minefields, more patrols, but still the U-boats were able to slip through the British defences. Losses did mount, however, and on one particular occasion in January 1915, ominously enough Friday 13th, the U-boat arm suffered a particularly discouraging blow. Three boats, U-22, U-31 and U-32, set out on patrol. U-31 struck a mine and was sunk with all hands. U-22 sank what she thought was an enemy submarine, but which turned out to be another U-boat, U-7. U-32 slunk back into harbour without achieving any success against, or even encountering, the enemy.

On 5 February, Kaiser Wilhelm declared all waters surrounding Great Britain to be a war zone. This was hardly unexpected in view of the

UB-43, another UBII Class submarine. The assembly on the prow of the vessel is a net cutter, intended to prevent the submarine becoming entangled in defensive underwater net screens.





This vessel, seen from astern, is captioned on the original photograph as U-49. Her shape and configuration resembles more closely a UBIII type boat however. The wireless masts can be seen to good effect.

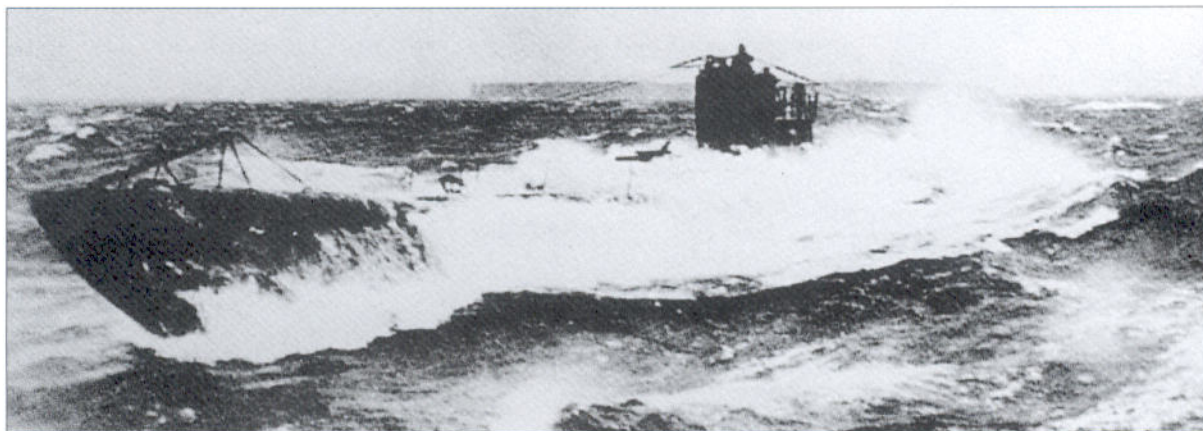
A UBIII Class boat in heavy seas near Heligoland. These boats could easily pass in such photographs for a Type VII U-boat of the Kriegsmarine.

British declaration of the entire North Sea as a 'prohibited zone' in November 1914 (itself technically a breach of International Law), in furtherance of its extensive blockade of German waters. U-boats would now have a far greater range of potential targets against which to strike. Each country was now effectively attempting the blockade of the other, the British with their massive surface fleet, the Germans, unable to match the strength of the Royal Navy, with its U-boats.

Up until February 1915, most U-boat operations were fairly minor, local affairs, and the successes which had been achieved, though often dramatic, were as much through luck and fortuitous accident than any grand design. Most of the U-boats in service were early pre-war models which were relatively primitive, and suffered often from problems with reliability, especially where the engines were concerned. As with the case of Weddigen and U-9, it had nevertheless been shown that these early boats could still be deadly in the hands of a skilled commander.

On 22 February 1915, implementation of the Kaiser's declaration commenced and the first major U-boat campaign began. By this time, twelve of the more powerful, larger boats had become available, boosting the total available strength after the first year's losses to 30, with a further 29 under construction. Many of the U-boat's greatest detractors were beginning to realise that Germany's greatest hope of success against Great Britain lay with the submarine. It would be unusual, however, for even as much as one-third of the total available boats to be at sea at any one time.

The German invasion of Belgium had also provided the Kaiserliche Marine with bases on the Channel coast, specifically Zeebrugge, Bruges and Ostend, from which the smaller UB and UC type submarines could launch attacks on British shipping. Generally speaking, the older





A meeting at sea in the Mediterranean between one of the very early small UBI coastal boats from the Constantinople flotilla, and a larger ocean-going vessel, the U-35 from the half flotilla based in Pola. The disparity in size is immediately apparent.

paraffin-driven boats of *Unterseebootsflotille 1* would operate in the English Channel whilst the diesel-powered boats of *Unterseebootsflotille 2* operated further afield, in areas such as the Irish Sea and the Southwestern Approaches.

The first successes of the new campaign fell once again to one of the older boats, this time U-8, which sank five British merchantmen out of a total of eight destroyed by U-boats during February. In March the total sunk was 29, in April 33 and in May 53 – a total of 123 sinkings in just over three months. These figures relate purely to the sinking of merchant ships. A number of warships also fell victim to U-boats during this period.

In the spring of 1915, the new coastal minelaying submarines of the UC class came into operation, laying mines along the French coast and also at the approaches to major British harbours, the intent being to damage merchant shipping bringing essential supplies into Great Britain, and also to hit the supply of essential war materials from Great Britain to the BEF in France.

The campaign suffered a major setback in May 1915. On the 7th of that month, U-20, under Kapitänleutnant Walter Schwieger, torpedoed and sank the liner *Lusitania*, believing it to be carrying troops (*Lusitania* was listed in *Jane's Fighting Ships* for 1914 as an 'Armed Merchant Cruiser'). A total of 128 of the 1,201 passengers who lost their lives were US citizens. America was outraged and President Woodrow Wilson immediately demanded the total cessation of the U-boat campaign. In

fact, although not carrying troops, *Lusitania* had indeed been carrying ammunition and other contraband war material.

Under extreme political pressure, Germany was forced to offer guarantees that U-boats would not endanger neutral shipping, and would not attack passenger liners, even if they flew the flag of a belligerent nation. The campaign was far from crippled, however, and over the next four months a further 365 merchantmen fell victim to U-boats. The rate of merchant sinkings was beginning to overtake the rate of new construction. Though the number of ships evading the U-boat menace and reaching safety in British ports reached as many as 1,500 per week, this could not be maintained if ships were to be sunk at a faster rate than they were being built.

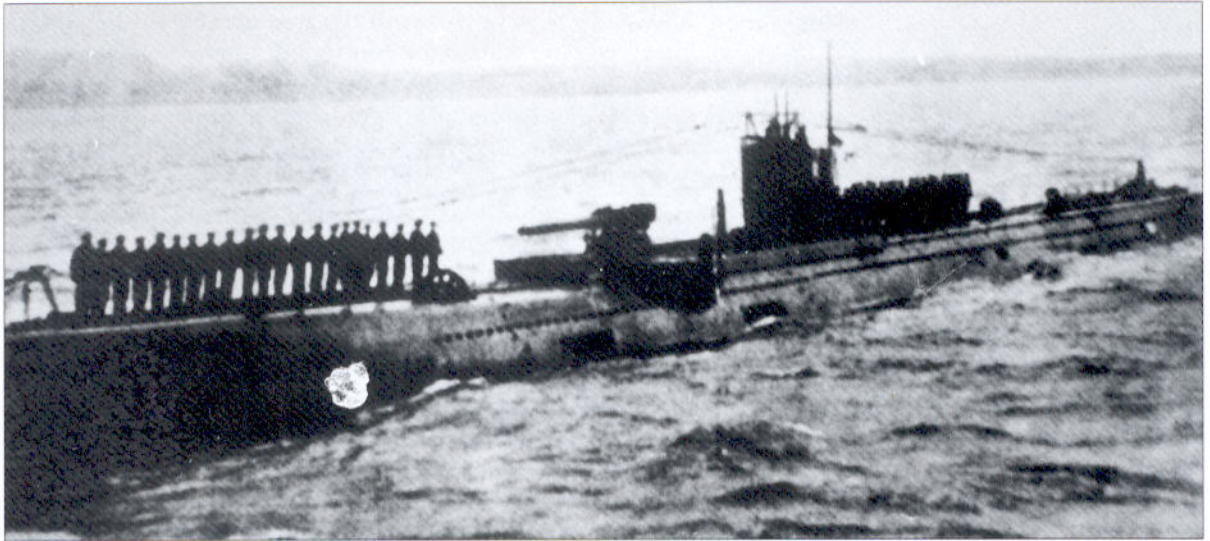
The campaign was brought to a halt when, within a period of just over two weeks, two further passenger liners were sunk by U-boats. One, the *Arabic*, again carried US citizens, though fortunately far fewer lives were lost on these two occasions. To rub salt in the diplomatic wounds, the second liner, *Hesperian*, was sunk by Schweiger in U-20. The Chief of the Admiralty immediately ordered the cessation of attacks on merchant shipping on any other basis than under strict Prize Regulations which required the U-boat to surface, establish the identity/cargo of the merchantman and then ensure the evacuation and safety of the crew before sinking her. This method of attack, though laudable in theory, exposed any submarine to immediate counterattack when she was at her most vulnerable – on the surface.

Another significant move in the U-boat war consisted of establishing bases for operations in the Mediterranean. A half flotilla consisting of five boats was based in Pola, Italy, and a full flotilla of some seven boats at Constantinople. Losses during the first nine months of 1915, though higher than in the previous year, were not unacceptable at around 17 boats lost.

1916

A second offensive was launched in February 1916 in an attempt to regain the initiative. The British blockade had begun to bite and imports of essential war materials were suffering badly. It was estimated that losses of war material to Germany due to the British blockade were at least three times as high as losses of imported material to Great Britain due to the actions of the U-boat.

By late December 1915, a proposal had been developed by General Erich von Falkenhayn for a two-pronged strike against the Anglo-French war effort. A new land offensive was to be launched towards the old fortress of Verdun that, it was hoped, would draw the French into a war of attrition that their army could not survive. It was suggested that a new all-out unrestricted U-boat campaign against merchant shipping should be launched to support the land offensive. Not surprisingly, many in the political hierarchy were horrified at the thought of the effect on relations with the United States should unrestricted submarine warfare recommence, and influence was brought to bear on the Kaiser to moderate these proposals. The attack on the Verdun sector was approved but, to the dismay of the navy, the proposal for unrestricted



submarine warfare was severely cut. Secretary of the Navy, Admiral Tirpitz, resigned his post in protest. How ironic it was that the man who had once declared to the assembled Reichstag in Berlin 'Germany has no need of submarines', should now resign in protest at not enough aggressive use being made of them.

The offensive began with a number of minor successes by boats of the UB type operating in the English Channel, sinking ships with torpedoes, and with minelaying by the UC class coastal minelaying boats.

Political disaster once again struck Germany, however, when on 24 March UB-29 torpedoed a crowded steamer entering Dieppe harbour, under the impression it was a troopship. It was, in fact, the cross-Channel passenger steamer *Sussex* filled with over three hundred civilian passengers. Fortunately, casualties were light at 50 from a total of 325 passengers, but unfortunately for Germany, half of the casualties were United States citizens. American reaction was predictably swift, and President Woodrow Wilson threatened an immediate breaking off of diplomatic relations with Germany unless the offensive was halted. Urged on by his political advisors, the Kaiser gave way and ordered that henceforth merchantmen could only be sunk in full accordance with Prize Regulations.

A number of U-boats had already been sunk by so-called Q-ships. These converted merchantmen were filled with ballast material such as cork, timber, empty barrels, etc, which would assist them to stay afloat if torpedoed, and had a substantial level of offensive armament considering the low level of armament of their foes. Intended to play the part of the 'helpless victim', the Q-ship would wait for the U-boat to surface, probably to deliver the *coup de grâce* with its deck gun, then reveal its true identity and open up on the U-boat with all of its armament.

In one notorious incident, a U-27 fell foul of a Q-ship whilst attacking a merchantman, the *Nicosian*. The U-boat being fatally damaged, the crew evacuated and took shelter on the very merchantman they had first attacked. Armed sailors from the Q-ship, the *Barralong*, hunted down the German sailors and killed all of them, on the pretext of preventing

U-117, one of the UEII Class minelayers with her crew mustered on deck. This boat was fitted with a large 10.5 cm deck gun, four bow torpedo tubes and could also carry up to 72 mines.

information leaking back to Germany of the true identity of the Q-ship.

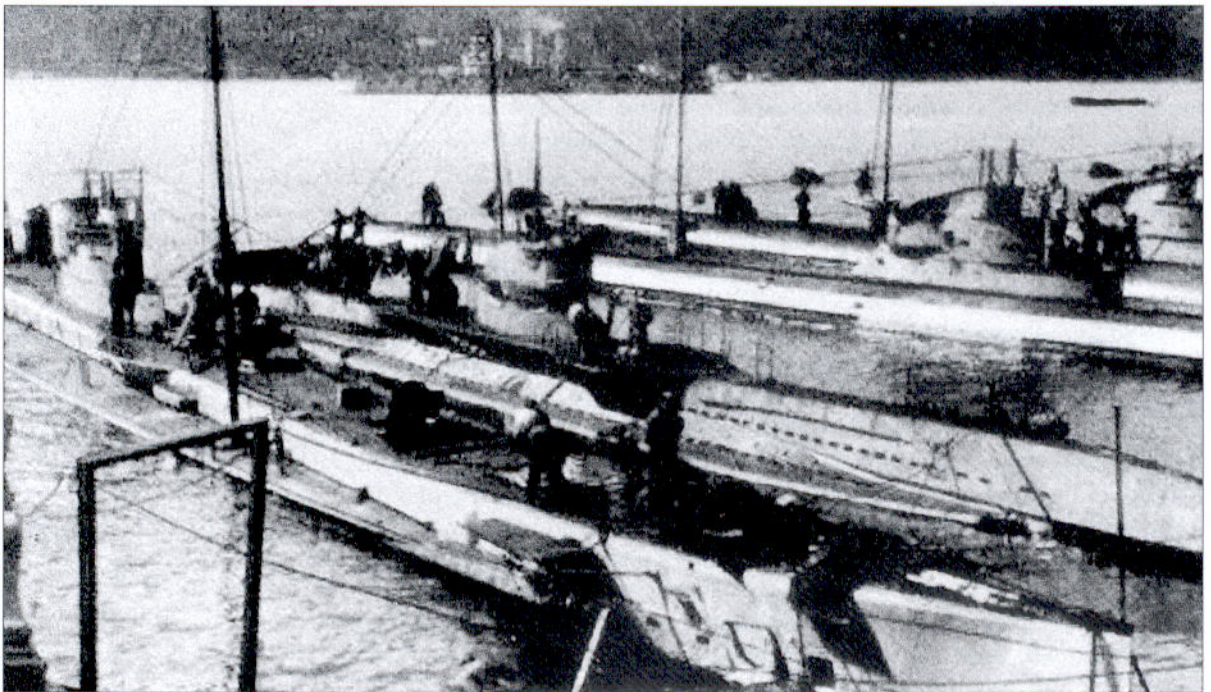
Severely hindered, the campaign continued, dampened somewhat by the capture, intact, of UC-5 after she had run aground on the shoals near Harwich. The offensive had not been a total failure however, with over 150 ships being sunk by U-boat action. It eventually ended on 25 April when the Commander in Chief of the Fleet, Admiral Scheer, ordered the U-boats back to their bases.

A new plan to use the U-boats to good effect was drawn up in May of 1916. A feint attack by units of the surface fleet would be made towards Sunderland. The ships would then withdraw hoping to bring out powerful units of the British fleet in pursuit. The German units would lure their pursuers into freshly prepared minefields and an intercept line of waiting U-boats. Due to mechanical breakdowns in some of the boats, and repeated delays in launching the attack, only three U-boats were still available when the action commenced, so the attempted ambush of the British Fleet failed and the subsequent surface engagement at Jutland saw the German High Seas Fleet meeting a full-strength British fleet.

A second such attempt was made in August, this time with an ambush line of 24 U-boats set to attack the unwary British. Unfortunately for the Germans, British intelligence intercepts of German signals alerted them to the German plan. Once again the plan failed, though this time with the consolation that U-boats did succeed in picking off two British light cruisers, HMS *Nottingham* and HMS *Falmouth*.

With the continued strangulation of German supply lines by the British blockade, a third offensive against merchant shipping was the only solution. Although most of those in power accepted that unrestricted submarine warfare would eventually become a necessity, when the offensive reopened in October, it was once again to be carried out within the restrictions of Prize Regulations.

U-boats of the Pola half flotilla moored at Cattaro. At extreme left is Kapitänleutnant Lothar Arnauld de la Periere's U-35, one of the most successful U-boats in history.





With the crew safely evacuated, U-35 proceeds to sink the enemy merchantman using her 8.8 cm deck gun. Max Valentiner would ultimately sink almost 300,000 tons of enemy shipping, becoming the third highest scoring submarine ace of all time. A torpedo would rarely be wasted in sinking a small sailing vessel such as this.

The offensive would open with attacks on merchantmen in the English Channel by UB type vessels of the Flanders flotillas. The larger, more powerful, UBII types ventured further afield, patrolling the Irish Sea, and the Western and Southwestern Approaches. Within four months, a total of 290 merchantmen had fallen victim to U-boats. Even more worrying from Britain's point of view was that the more powerful, larger and more modern diesel-powered vessels were able to reach the east coast of the United States where U-53, a 700-tonner of the improved U-41 type, sank five merchant ships.

Another area where the U-boats achieved considerable success was in the Mediterranean. Here, one single captain wreaked havoc. In command of U-35, Kapitänleutnant Lothar Arnauld de la Periere had accounted for over fifty merchantmen in a rampage lasting three weeks. Amazingly, he had used only four torpedoes during this period, preferring to surface and attack his victims with the 8.8 cm deck gun carried on his submarine. This officer, who was to become the greatest U-boat 'ace' of all time, was a chivalrous sailor who invariably made certain that the crews of any ships attacked by him were given sufficient time to evacuate their vessel safely and were provided with directions for the nearest landfall, before it was destroyed.

Although ten U-boats were lost during this phase of the war at sea, a total of 768 ships had been sunk by German submarines on all fronts and a further 178 seriously damaged. This was achieved by a force of around 96 U-boats.

Buoyed by these successes and having seen peace overtures towards the allies rejected in December, the Germans now saw an all-out unrestricted U-boat campaign as the only sure way of having a chance to achieve victory. Hoping that Britain could be starved into submission and the French defeated on the battlefield before the United States would be in a position to mobilise and train her awesome potential pool of manpower, Germany's military leaders clamoured for permission to launch an all-out U-boat offensive, in the belief that Britain could be brought to her knees within six months. The situation on the German home front was beginning to look ominous, with shortages of food beginning to affect civilian morale seriously. Germany knew that time was of the essence and the risk of drawing the United States into the war was one that would have to be taken.

1917

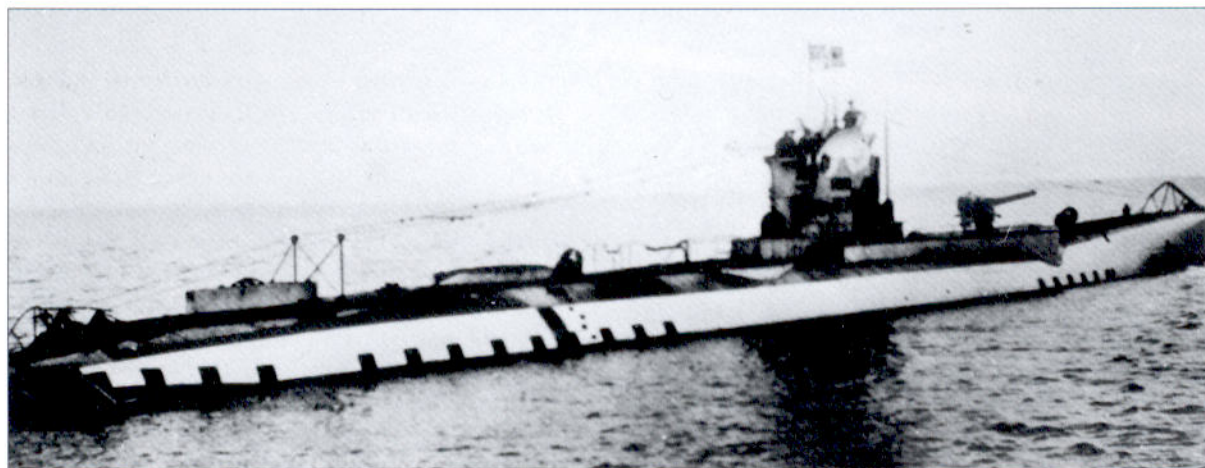
Kaiser Wilhelm accordingly issued a directive that an unrestricted U-boat offensive be launched on 1 February 1917. All Allied or neutral shipping that was encountered in the English Channel, the western North Sea and an area extending some 400 miles west into the Atlantic from the coasts of France and Great Britain was to be sunk without warning. The Mediterranean, apart from some narrow corridors allowed for movement of neutrals, was also included.

At the commencement of this new offensive, the *U-Bootwaffe* had a total available operational strength of 105 boats. Of these, 69 were operating from German or Flanders bases. As some boats would be travelling out from port, some returning to port, and others on station, the maximum on combat duty at any one time was under 40.

Almost immediately, the U-boats, and particularly those larger boats operating in the Western and Southwestern Approaches, began to take a heavy toll of Allied shipping. In the month of February alone, over 250 ships were sent to the bottom. Sinkings increased apace and in March over 300 were sunk. By April, it seemed as though the Germans' somewhat optimistic goal of crippling Great Britain within six months might well be achieved when 413 ships totalling almost 900,000 tons were sunk. Merchant shipping reaching British ports was reduced by almost 75 per cent compared with the previous year's average. Many neutrals now considered sending their ships to British waters far too dangerous. British harbours were becoming choked with neutral ships that had arrived safely, but considered it too dangerous to make the return trip. Shipyards were also becoming overburdened with repair work on damaged ships, which in turn hindered production of new vessels. Sinkings were now outweighing new construction at a rate of almost four to one.

Despite every effort being made, all anti-submarine counter-measures used by the Allies were proving to be virtually ineffective. Only nine U-boats were lost during this period, three of which were sunk by Q-ships. Unlike the situation with Allied merchant shipbuilding, the German U-boat new-build rate had exceeded losses, so that U-boat strength actually increased during this period.

U-135, a medium-size ocean-going boat or 'mittel-U', armed with six torpedo tubes and a 10.5 cm deck gun. Of interest is the two-tone paint scheme, the hull sides painted light grey and the upper surfaces dark grey.



Attacks on US-registered shipping finally drove the United States to declare war on Germany on 6 April 1917.

The British answer to the slaughter of merchant shipping in the first quarter of 1917 was to introduce a three-fold policy of counter measures. These consisted of an all-out effort in merchant shipbuilding and purchase of ships from overseas to offset sinkings, extensive minelaying in the Heligoland Bight in an attempt to sink U-boats setting off on, or returning from, patrol and, most significantly and ultimately successfully, the introduction of the convoy system. The British, however, were cautious in the introduction of the convoy system and though it showed immediate benefits in reducing losses where used, the major proportion of shipping still travelled alone and unescorted.

By the spring of 1917, the total number of U-boats in service had grown to 126, and the average number at sea at any one time had likewise grown to in excess of 50. These included some of the new heavy U-cruisers, though the advantage of the large-calibre deck guns on these latter types was offset somewhat by the return to unrestricted warfare, where most ships were sunk by torpedo attack without warning rather than being intercepted on the surface and sunk by gunfire. These U-cruisers, however, had the advantage of an enormous cruising range, more than 25,000 nautical miles for the U-151 to U-157 type, and their powerful armament meant that they rarely had to dive to escape enemy action, being capable of taking on small enemy warships on a more than equal footing. Thus, they could cruise on the surface and make maximum use of their phenomenal endurance.

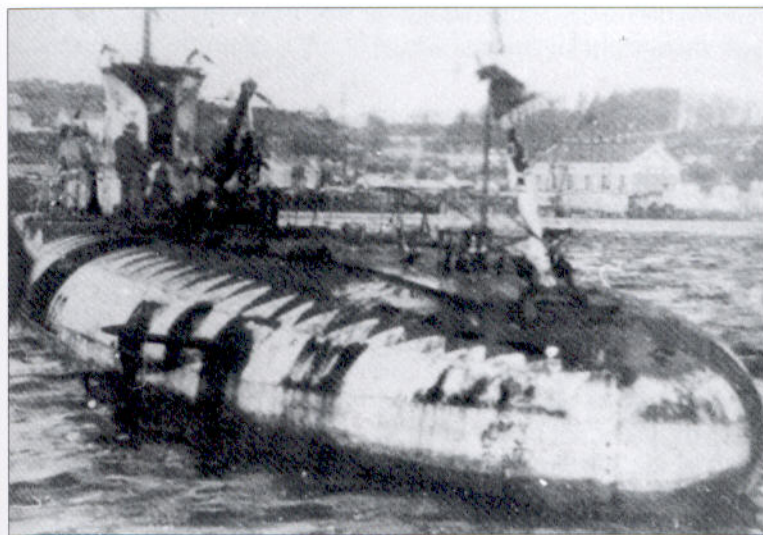
Between May and July of 1917, a further 795 merchant ships were sunk by U-boats, once again the greatest successes being achieved by the larger, ocean-going types, though the smaller UB craft and UC minelayers continued to play their part. U-boat losses by the summer of 1917 were still being more than compensated for by the new-build rate, whilst the rate of merchant ships lost to U-boats was in excess of fifty to one. The situation for Britain was becoming desperate.

The Germans, though realising that their original hope of bringing Britain to her knees in six months had failed, could see that they

were now on the verge of victory and embarked on a frenzied programme of additional U-boat construction, with 95 new boats being ordered.

In the second half of 1917, the emphasis began to shift from attacks on shipping on the high seas, which were becoming more and more problematic due to the increasing use of the convoy system, to attacks in coastal waters. Even those ships that had arrived in British waters in convoy, tended then to disperse and make their way individually to their port of destination, thus providing a more tempting target for the U-boats.

U-113, a medium-size ocean-going boat fitted with a 10.5 cm deck gun. Note the rounded 'cigar' shaped hull typical of this class.



The majority of losses were now being suffered at an average of only ten miles distance from land. The convoy system was, however, beginning to prove its worth. Statistically, it was shown that ten times as many vessels travelling independently were lost compared to those travelling in convoy.

The last quarter of 1917 also saw the introduction of a new anti-submarine weapon that would at last prove effective against the U-boat, the H2 mine. This is the type that would become instantly recognisable to all by its projecting detonator horns. It is believed that as many as 16 U-boats may have been lost to this weapon during this period, the greatest single cause of loss.

Having finally developed an effective anti-submarine measure, the British set about laying extensive new minefields in both the North Sea and English Channel. In the Channel, the mine belt stretched across the entire channel from Folkestone to Cap Gris-Nez and was up to six miles wide, consisting of twenty parallel rows of mines at varying depths. Over 9,000 mines were laid.

The great northern mine belt from the Orkneys across to the Norwegian coast was less comprehensive. So great was the area to be covered that it was estimated over 200,000 mines would be required. In the event, only some 70,000 were laid, and most of these were a relatively new and unproven American-manufactured magnetic mine. Minefields were also laid around German U-boat bases in the Mediterranean.

Although the North Sea and Mediterranean minefields were relatively unsuccessful, the Channel fields had an immediate effect, anything up to 26 U-boats being believed lost to mines in the Channel.

1918

By the spring of 1918, the tide was turning, as new U-boat construction was now only just keeping pace with losses. The final nail in the coffin of the U-boat offensive was the introduction of the convoy system for coastal waters also. This meant that shipping in inshore waters was now gathered together and protected by naval vessels (as well as shore-based aircraft and airships). Sinkings of merchant vessels now began to plummet and U-boats were forced to resort to surface attacks under cover of darkness, where their small size made them difficult for any escort vessels to spot.

Sinkings fell from 123 ships in January, down to a mere 15 ships in November. The Germany offensive, though it came perilously near to succeeding, had clearly peaked. Meanwhile, the British blockade of Germany had continued and the situation in Germany was becoming untenable. Food shortages were catastrophic and much of the population was seriously undernourished. The Kaiser gave instructions to his Chancellor to seek armistice terms from the Americans, who refused to treat unless all U-boat attacks on merchant shipping ceased.

Accordingly, on 20 October 1918, the recall of all U-boats at sea was ordered. The German Admiralty decided to gamble all on one last battle. In a repeat of the ill-fated ambush attempt which resulted in the Battle of Jutland, attacks were to be made by the assembled High Seas Fleet on shipping along the southeast coast of Great Britain. Once lured out to respond, the British were to be drawn over a line of 22 waiting U-boats.



U-98 in Whitley Harbour after being brought to the UK following the German surrender. Note that two deck guns are fitted, a forward 109.5 cm and an after 8.8 cm.

The German Navy would either succeed, and thus be in a position to extract more favourable armistice terms, or die fighting. As the High Seas Fleet began to assemble, however, mutiny broke out on many of the larger warships. Clearly the Navy was in no position to prosecute this latest offensive plan and the Fleet was dispersed. The U-boat crews, however, remained loyal to the end.

On 11 November 1918, Germany accepted the terms of the Allies' armistice and hostilities ceased.

The *U-Bootwaffe* had represented Germany's only real chance to achieve a successful conclusion to the war. Right to the end, although U-boat losses had grown alarmingly, the Kaiser retained a large U-boat fleet at his disposal. At the conclusion of hostilities, over 170 U-boats remained in service and available for action. The U-boats had not been militarily defeated, but had simply been prevented from achieving sufficient sinkings to bring Great Britain to her knees. Had Germany developed effective anti-convoy tactics, she may well have still been able to achieve that objective. The only true answer to concentrating merchant ships in convoys for protection was to concentrate U-boat forces together in the attack. Although this tactic, the so-called wolf pack, would be used to good effect in the Second World War, by then sufficiently advanced anti-submarine measures would be available to prevent its ultimate success. Used in the First World War, it may just have succeeded.

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It is hard to imagine a book written on any technical aspect of the U-boat that does not owe a great debt to Rössler's work, certainly the finest and most detailed study ever written on the subject.

COLOUR PLATE COMMENTARY

A: PRE-WAR U-BOATS

This plate shows the pre-war, paraffin-fuelled U-boats. These boats all have the highly distinctive ventilator tubes.

1) U-1 This full-hull view shows the usual early rudder configuration, with the rudder blade set forward of the propeller. The general colour scheme for U-boats of this period was light grey on the upper hull and conning tower, black on the hull below the water line, and dark grey on the deck and top surfaces of the saddle tanks. These boats all carried their number on the side of either the conning tower or the bow. In this case a large white '1' is painted on the side of the tower. U-1 spent the whole of the First World War as a training boat and so would have been kept in relatively good condition. Both the forward and after ventilator tubes are hinged to allow them to fold flat against the deck.

2) U-2 Slightly larger than her immediate predecessor, U-2 has only one folding ventilator tube, on the after deck, and a large folding mast forward. Again, her hull number is painted in white on the side of the tower.

3) U-4 Similar in general layout to the U-2 type but larger, U-4 has a large folding mast both forward and aft and a single collapsible ventilator on the after deck.

4) U-5 Larger again, the U-5 has its folding masts located to the starboard side of the hull, lying along the top of the saddle tanks. Note the railings around the top of the conning tower, onto which canvas screening was often fixed.

5) U-9 This model is distinctive in that its large, double ventilator tube on the after deck is set forward of the folding mast. The boat number is shown in white on the side of the bow. A canvas screen is fitted around the conning tower on this boat, with which Otto Weddigen sank the three British cruisers *Hogue*, *Cressy* and *Aboukir* on 21 September 1914.

B: SURFACE ATTACK

For much of the First World War U-boats would, wherever possible, stop and sink their victims on the surface. The complement of torpedoes carried on vessels of this period was extremely limited, no organised convoy system had yet been introduced and effective anti-submarine weapons were minimal. It was generally safe, therefore, for a submarine to surface and stop a lone travelling merchantman, order her crew to abandon ship, then sink her with gunfire. Many of Germany's top U-boat aces of the *Kaiserliche Marine* scored the bulk of their sinkings using the deck gun.

For much of the war, sinkings were carried out under Prize Regulations, the submarine being obliged to ensure the safe evacuation of the victim's crew before sinking her. Although there were exceptions, the vast majority of U-boat commanders honoured these rules and earned a reputation for chivalrous conduct, despite the claims of Allied propaganda of the time.

Here we see one of the most common U-boat types, the UBIII, which, having halted an enemy merchant ship on the surface, has drawn close to her and is about to send her and her essential cargo to the bottom. The U-boat crew open fire with their 8.8 cm deck gun as the merchant crew, having

taken to the boats, pull away from the stricken vessel. The U-boat gunners will aim for the merchantman's waterline, allowing water to pour in through the shell holes. This could be a long-drawn-out process, many shells being required before some larger merchantmen sank.

C: UC-15, UC-34, UC-98 AND UC-140

This plate shows the range of U-boat models, from the tiny coastal craft to the huge ocean-going U-cruisers, all of which contributed to the successes of the *U-Bootwaffe*.

1) UC-15 One of the tiny UCI class of coastal minelaying submarines. These boats carried a crew of only 12 men but nevertheless performed well. Of note is the helmsman's wheel to the front of the tower to allow the boat to be coned whilst on the surface. This class carried only its mine load, no torpedoes or deck gun being provided.

2) UC-34 This medium UCII class minelayer could operate further afield than its smaller predecessor and was also armed with two torpedo tubes, housed in large bulged fairings either side of the bow, as well as a single stern tube. They also had the advantage of carrying a short-barrelled 8.8 cm deck gun, allowing them to tackle small merchant craft on the surface. The raised portion of the foredeck covered the mine-carrying tubes featured on this class.

3) UC-98 This, one of the largest of the coastal minelayers of the UCIII class, featured a highly distinctive set of torpedo tubes mounted amidships, the bow area being given over to mine stowage. This type featured a larger 10.5 cm deck gun.

4) U-140 was a large ocean-going U-cruiser armed with two 15 cm guns. She was certainly capable of attacking anything up to an armed merchant cruiser on the surface and indeed most of these larger vessels did make extensive use of their deck guns as well as torpedo armament. It was not intended that this type fight it out on the surface with enemy warships, but the greater range of her large-calibre deck guns probably would have allowed her to fend off smaller, lone enemy warships, such as corvettes or even destroyers, before they were within range of their attackers' guns.

D: TYPE UBIII CUTAWAY VIEW

A cutaway view of a typical Type UBIII boat shows many of the classic layout features of this boat, which were to be closely replicated in the ubiquitous Type VII of the *Kriegsmarine*. The 'occupied' portion of the boat is that part which is contained within the steel pressure hull, much smaller than the exterior appearance of the boat, with its outer casing, would suggest. The basic shape of the pressure hull is tubular, with both forward and stern ends being tapered.

At the bow end, the pressure hull is pierced by four torpedo tubes, the forwardmost compartment being the torpedo room. Moving aft, the next area comprised the lower ratings' accommodation, fitted out with two-tier bunk beds. Submarines rarely if ever provided enough accommodation for all the crew. In general, two men shared a bunk, one occupying it whilst the other was on watch. Next came the warrant officer and officer accommodation, only marginally less Spartan and cramped than that of the lower ratings. Under the floor plates of both the forward warrant officer/officer accommodation and the aft petty officer accommodation, were stored the boat's batteries. The control room, with the conning tower above, was more or less centrally located within the pressure hull (and was

indeed usually referred to as the *Zentrale*). Here were located the boat's main controls for the diving planes, the main controls for venting the ballast tanks, the navigator's table, radio equipment and the eyepiece for the navigating periscope. Within the conning tower was the commander's tiny attack position, with the eyepiece for the attack periscope. It was from this position that the commander conned the boat during a submerged torpedo attack. Under the control room floor plating were tanks for drinking water and also storage for ammunition for the deck gun. Aft of the control room was the petty officer accommodation provided, once again, with two-tiered bunks. Moving astern, next came the engine room with its two large diesel engines flanking a narrow central walkway. To the rear of the diesels, coupled to the same shaft, were the electric motors used to power the boat when submerged, and finally the single stern torpedo tube, firing out between the twin propeller shafts.

E: U-35, UB-122, U-78 AND U-122

This plate shows some of the range of medium-sized ocean-going U-boat types.

1) U-35 This is the so-called Ms (*Mobilisierungsplan*) boat commanded by the greatest U-boat ace of all time, Kapitänleutnant Lothar Arnauld de la Periere, whose final total of 453,700 tons sunk still stands today as an all-time record. The boat has a distinctive 'hump back' appearance to its afterdeck. An 8.8 cm deck gun was fitted and this model also carried two bow and two stern torpedo tubes.

2) UB-122 This UBIII type is a member of the most successful class of U-boat in the Kaiser's Navy, so successful in fact that the Type VII which formed the backbone of the Kriegsmarine's U-boat force was a direct descendant of this type. Only the twin collapsible radio masts instantly identify the type as a boat from the Imperial Navy. Four bow and one stern tubes were fitted, as well as an 8.8 cm deck gun.

3) U-78 The UEI class was a rather unusual looking vessel in that it had its main deck armament located on the afterdeck. It carried only one bow and one stern torpedo tube. The bow torpedo tube was set on the port side, not visible on this artwork, but which can be seen in one of the accompanying photographs. This particular boat sports a rather unusual but highly effective disruptive camouflage colour scheme.

4) U-122 One of the large ocean-going minelayers of the UEII class, this type carried both 8.8 cm and 5 cm deck guns, and was armed with four bow torpedo tubes as well as her complement of up to 72 mines. Note that the deck level lowers somewhat from just in front of the gun platform forward to the bow.

F: TYPE UBIII

This plate shows a typical UBIII type boat in heavy seas. Under water, she would make a maximum speed of just 8 knots, but on the surface could achieve almost 14 knots. Travel underwater quickly depleted the boat's batteries which would then need to be recharged from the

main diesel engines. It was common, therefore, to remain on the surface wherever possible, unless the seas became impossibly rough. A total of 89 UBIIIs were built, making it by far the most successful of the U-boat designs. Crewed by a complement of 34 officers and men, the type had a range of some 8,500 nautical miles, making her capable of operating well out into the Atlantic.

G: U-25, UB-4, UB-39, U-161 AND U-135

Shown here is a selection of significant U-boat designs, varying greatly in size and in their intended purpose.

1) U-25 One of the medium Ms type boats, U-25 is shown here full-hull. The later move to a more conventional rudder arrangement, with the rudder blade to the rear of the propellers, was typical of most wartime-constructed boats. U-25 was armed with two 8.8 cm guns.

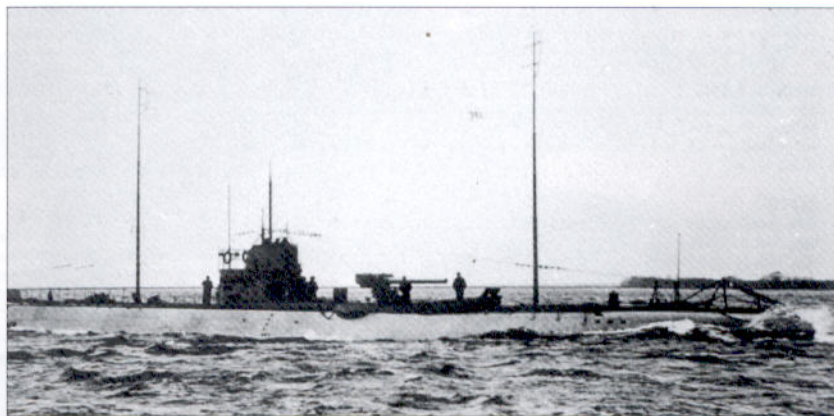
2) UB-4 This diminutive coastal-type boat carried only two torpedoes and had as its deck gun a single 8 mm machine gun. This example was given a rather elaborate ripple-effect, two-tone camouflage. Other early examples of the type are known with eyes and shark's teeth painted on the bows.

3) UB-39 The UBII type, though a little larger than its immediate predecessor, was still rather lightly armed. It still had only two bow torpedo tubes fitted but unlike the UBI, carried two spare torpedoes. It also had its deck armament beefed up from a single 8 mm machine gun to a 5 cm naval gun.

4) U-161 This medium-sized Ms boat, the type often referred to as the *Mittel-U*, is a rather more streamlined and modern looking vessel, though she still carries the exposed helmsman's position in front of the tower. With four bow and two stern tubes, a complement of twelve torpedoes plus a 10.5 cm deck gun she was a relatively powerful craft.

5) U-135 One of the largest of the Ms boats, this class had four bow and two stern tubes, a complement of 14 torpedoes, and a powerful 10.5 cm deck gun (some others of her class had two 10.5 cm guns fitted). She carried a crew of 46, the largest crew size outwith the U-cruiser class. This vessel sported an unusual paint scheme in two-tone grey with an attempt at a disruptive pattern on the side of the tower.

U-122, another UEII Class boat. The size of her deck armament can be gauged against the size of the crewmen standing by her forward 10.5 cm gun.



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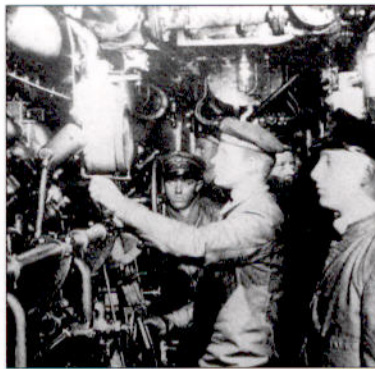
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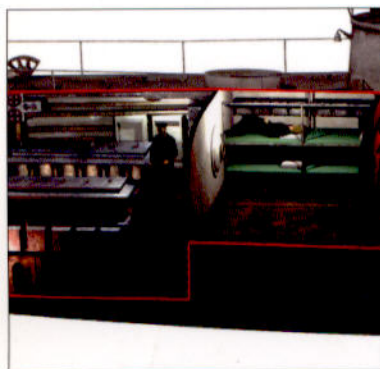
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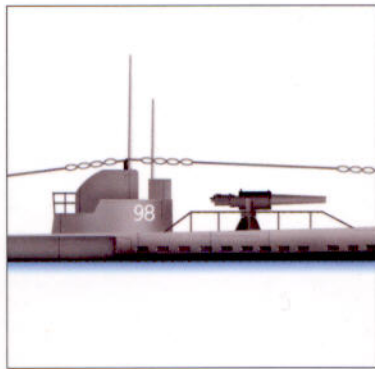
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