

U 505: Modifications, Colours & Insignia

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Contents

⊕	Part I	Introduction
⊕	Part II	Historical Overview
⊕	Part III	Pre-capture Modifications
⊕	Part IV	Radar & Radar Warning
⊕	Part V	Countermeasures
⊕	Part VI	Damage During Capture
⊕	Part VII	Future Kriegsmarine Modifications
⊕	Part VIII	Post-capture Modifications
⊕	Part IX	Current Features Versus Revell Kit
⊕	Part X	Insignia & Paint Colours
⊕	Part XI	AMP Decals & Flags
⊕	Part XII	Summary Tables
⊕	Part XIII	Acknowledgements, References & Sources

Part I - Introduction

In late 2013, Revell released their long-awaited Type IXC U-boat kit in 1/72nd scale (kit number 05114). At the time of writing, first impressions of the kit have been generally very positive. One reason may be that Revell chose to depict U 505, a museum boat which currently resides in the Museum of Science and Industry (MSI) in Chicago. This afforded them the opportunity to study a real life boat which is much the same (but not exactly, as we shall see) as a wartime Type IXC boat.

Although the kit is impressive, the same cannot be said for the kit decals. Both the waterline draught marks included in the kit and the tower emblem decals are entirely unsuitable. Alternative decals have been designed by Accurate Model Parts to replace these inaccurate kit decals. This article was primarily written to explain why the Revell emblem decals require replacement, and to determine the patrols in which each emblem was present.

It is important to recognise that technical features and weapons were added or removed from U 505 in line with technological advances or the need to combat the growing air threat posed by Allied aircraft. Due to the constant modifications made to the boat over time, it is not historically accurate to place the lion emblem of the boat's first commander on the Revell kit without making suitable adjustments to the kit tower. Only by a careful study of the patrol dates, refit dates and established modification timeframes can we match both the emblems and the technical features to a specific time frame. Once this is ascertained, it then becomes possible to state what features were present when the lion, axe and shell emblems were present on the boat.

Although the author has completed this type of study on other boats, the previous studies were conducted precisely because a range of photos were available to show the individual boat at every stage. Due to the dearth of wartime U 505 photos available in current circulation, this present study has been especially difficult. Readers should be aware that such lack of photographic material means that my interpretations are subject to error. It is possible that new information, or previously unseen photos, will be unearthed and these will bring the results of this article into question. Some of the results herein are, it is fully admitted, simply logical conclusions determined from the sources available at the time of writing. It is hoped that the author may be forgiven for any errors in judgement made when trying to assess the full modification history of the boat without adequate resources.

The subject audience of this article is primarily a modeller undertaking the building of Revell's U 505. Other related subjects, such as the full history of the boat, are considered peripheral to the purpose of this article, and will not be covered in detail. The exception is a very basic coverage of the boat's operational career, which is presented to give the reader some idea of the major events which occurred during the boat's history.

Additional information, such as the modifications U 505 may have received if it remained in Kriegsmarine service throughout the war, have been included to assist modellers who wish to depict other boats. Many of the features in this article are also relevant for mid-to-late war Type VIICs and VIIC/41s. Details of Type VII modifications may also be found in the AMP pdf *The Wolf Pack: A Collection Of U-Boat Modelling Articles*.

The fitting dates of certain features do not correspond in two important books about U 505. In addition, the fitting date of the 37mm automatic in one book does not fit in with the "conventional" dates proffered in U-boat literature. Without photographic evidence I am in no position to assert which is correct. Both dates are provided in this article, along with some supporting evidence, and the reader can make their own judgement on the matter.

Patrol numbers

When U-boats went to sea on a war patrol, technical failures or issues which became apparent during a test dive sometimes resulted in a direct return to port. Sources can be conflicting with regard to patrol numbers because opinions vary in what may, or may not, constitute a war patrol. Usually sources will only attribute a patrol number to a full war patrol. Due to the very high number of aborted patrols in U 505's operational career, and the requirement to be very particular with every period when the boat was in port, in this study each patrol - regardless of whether it was an aborted patrol or full patrol - has been attributed an individual number. For this reason, the patrol numbers used in this article and in the summary tables at the end do *not* correspond with the patrol numbers in other sources. There are 14 patrols listed in this article, whereas *U-Boat Fact File* by Peter Sharpe lists ten patrols and the website uboat.net lists twelve patrols.

In the summary tables, the X suffix denotes a refit or time in port. 3X, for example, refers to the refit period before patrol 3.

Special thanks

I would like to extend my sincere appreciation to Jon Kelly, who is known as Capt Kremin on the AMP forum. In the course of one forum thread, in which the fitting date of the Turm II, Turm IV and 37mm automatic was discussed, Jon alerted me to important passages in *Steel Boats, Iron Hearts: A U-Boat Crewman's Life Aboard U-505* by Hans Göbeler, and was kind enough to send me direct quotes that were relevant to the topic. These quotes, together with our discussion of the "well wishers" photo, and many other topics relating to Type IXs, allowed a clearer picture to emerge. It was also Jon, not the author, who spotted that a camouflage pattern was applied to U 505 following the Hudson attack. I think it is fair to say that the results of this article have been much improved by his contributions.

I would also like to take this opportunity to thank Revell for their new Type IXC kit. The decal issues are minor and can be easily fixed. But thanks to Revell we finally have a very good Type IX model kit, which is very enjoyable to build and looks stunning even as an out-of-box build. Thanks Revell!

Part II - Historical Overview

The boat

Out of the many hundreds of U-boats serving in the Kriegsmarine in World War II, U 505 ranks as one of the best known of all U-boats. This is partly due to her dramatic capture on the high seas, and partly because she has survived as a museum boat in Chicago's Museum of Science and Industry (MSI). What might not be realised by the millions of enthusiasts who have visited the boat are the numerous dramatic incidents which took place during her wartime career. This included the sinking of eight ships, being hit by one of her own circle-running torpedoes, being the most heavily damaged U-boat ever to return to base, seven patrols being aborted due to technical issues and sabotage, the suicide on board of one of her commanders, and the remarkable capture by US naval forces. Lastly, against all the odds, the boat managed to evade the attentions of the scrap man by journeying all the way to Chicago, an inland city not known for its proximity to the Atlantic Ocean. The boat will remain throughout the ages as a lasting testimony to those who fought and perished on both sides in the Battle of The Atlantic.

U 505 was one of 193 Type IX U-boats operated by the German Kriegsmarine. The boat was built in the *Deutsche Werft AG* shipyard in Hamburg in the batch between U 501 - U 506. While the late-war tower presently on the boat provides an impression of a late-war U-boat, the boat was actually laid down early in the war, on the 12th June 1940. The boat was launched nearly a year later, on the 24th May 1941, with the commissioning ceremony taking place a few months later on the 26th August 1941.

The U-boat fleet included two Type Is, eight Type XBs (mine-layers / transport), ten XIVs (supply), XXIs (large electric boats), XXIIIs (coastal electric boats) and a few research types. But the main types which played a leading role in the conflict were the Type IIs, VIIs and IXs. The Type II was a small coastal submarine which operated in the North Sea in the early war years. The medium-sized Type VII, often described as the workhorse of the fleet, was produced in vast numbers and became famous for operating with sustained success in wolf packs against Allied convoys in the North Atlantic. The final main type was the large, ocean-going Type IX U-boat. Their larger size accounted for longer diving times and reduced manoeuvrability compared with their smaller brethren. Although this made the type less suitable for convoy attacks, it did allow a much longer range which made them suitable for long range solo patrols. Their attacks off the coast of America were particularly successful in the months directly after the US entered the war.

The slight differences in the specifications between the IXA, IXB and IXC can be seen in the table below -

Specifications of 193 Type IX U-boats					
Variant	Number	Surface displacement (tons)	Length (metres)	Beam (metres)	Draught (metres)
IXA *	8	1,032	76.5	6.5	4.7
IXB	14	1,051	76.5	6.8	4.7
IXC	54	1,120	76.8	6.8	4.7
IXC/40	87	1,144	76.8	6.9	4.7
IXD1	2	1,610	87.6	7.5	5.4
IXD2	28	1,616	87.6	7.5	5.4

* Original IXs are now referred to as IXAs

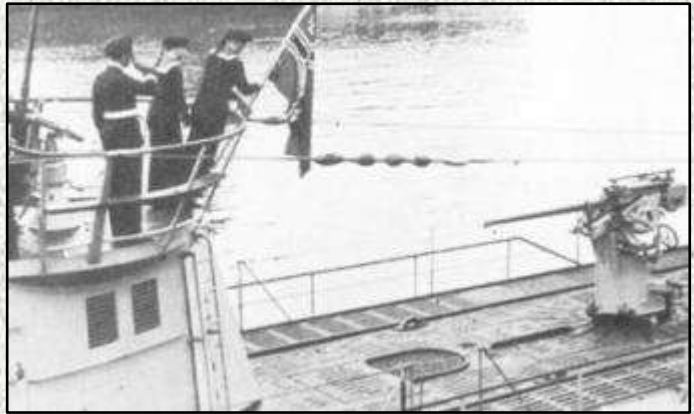
Of importance to modellers is the question of external differences between the IXC and the IXC/40 sub-variant. The 10cm difference in beam on the real boats equates to only 0.14cm in 1/72nd scale. This would be hardly noticeable to the naked eye. More importantly, it does not appear that there were obvious visual differences between an IXC and an IXC/40. Therefore, unless being very particular, one might wish to use the Revell IXC kit to model an IXC/40.

The first commander - Alex-Olaf Löwe

One aspect that is rarely appreciated by visitors to the Chicago museum is how early the boat was commissioned into the Kriegsmarine. It was way back in August 1941 when her first commander, Alex-Olaf Löwe, raised his commissioning pennant on the commander's flagstaff.

Löwe was a competent and calm commander, very popular with his crew and also successful in sinking Allied ships. The first war patrol was in reality a transfer passage from Kiel to the new operating base in Lorient. In the second patrol off the western coast of Africa, and the third patrol in the warm waters of the Caribbean, Löwe would sink seven ships. In subsequent patrols, after the first commander had departed, only one more ship would be sunk.

Löwe's successful spell as a U-boat commander was cut short towards the end of the third patrol in the Caribbean, when a return to base was required due to his appendicitis. Following this patrol he was transferred to shore duties.



Above (1): The Kriegsmarine flag being hoisted for the first time during the commissioning ceremony of U 505. We can see that the boat had an original Turm 0 tower (without a lower wintergarten platform), Hellgrau 50 paint, and a 37mm semi-automatic on the aft deck. The two black rectangles on the sides of the tower were air intake holes for the diesel engines.

Below (2): The Hudson attack in November 1942 severely damaged the aft deck, with the 37mm gun and much of the casing on the port side being completely blown away.

The second commander - Peter Zschech

Replacing the popular commander was Peter Zschech, who was in line for a command of his own after serving as First Watch Officer on U 124 for four very successful patrols. However, the successes he shared aboard U 124 were not to be repeated when he took over command of U 505. His authoritarian command style contrasted sharply to that of his predecessor. Along with an aloof and moody nature, his style did not endear him to his new crew and he would fall short of the high standards expected of him.



On the 10th November 1942, during Zschech's first patrol, U 505 was attacked and very seriously damaged by a Lockheed Hudson aircraft. Zschech actually ordered the crew to abandon ship but this was not followed by some crewmen, who were correct in assessing that the boat was not sinking. When the crew climbed out of the tower, they could see extensive damage had been wreaked to the aft deck. The 37mm on the aft deck was completely gone, having been completely blown away in the attack. Following repairs to the pressure hull, a makeshift camouflage pattern was painted in the vain hope of trying to disguise the gaping hole in the aft deck. Despite the grave technical condition, and to the horror of the crew, Zschech was still hunting for targets. Having served on U 124, a famous and very successful U-boat, the new commander was plainly over anxious to sink tonnage. When U 505 fired a torpedo, it became a "kreislaeuffer" - a circle-running

torpedo - which turned around and struck the U-boat. Luckily for all aboard the warhead did not explode.

Although the boat managed to reach port, it was assessed as being the most heavily damaged U-boat to ever make it back to port. Field Marshal Erwin Rommel and Luftwaffe General Adolf Galland were amongst the dignitaries who visited U 505 when repairs were being made. The Desert Fox apparently shook his head in disbelief when he saw how badly damaged was U 505.

Zschech's lack of success to date would be aggravated by a prolonged period in refit, when extensive repairs and modifications were completed. When U 505 did finally leave on patrol in July 1943, the so called happy times, when successes came quickly, were over for good. The Allies had greatly increased numbers of escorts and aircraft, a higher level of expertise, and had made significant technological gains, particularly in the field of radar. The threat of Allied air attack was ever present, accounting for the loss of over 40 boats in May of 1943. In fact, it was this month in which the tide of war in the Atlantic turned firmly against the *U-bootwaffe*.

The grave dangers presented by air attack, and the overall decline in U-boat successes at this time, meant that the opportunities for Zschech to achieve the success he craved were now greatly reduced. Yet another aspect would prevent Zschech and U 505 from sinking Allied shipping. Following July 1943, numerous technical issues would plague the boat and her commander. Patrols were aborted on no fewer than *six* occasions under Zschech's command. Many, or indeed all, were caused by sabotage. The frustration was also keenly felt by the crew. In *Steel Boats*, former U 505 crewman Hans Göbeler relates how he beat up a French saboteur who taunted him about the boat's lack of progress after leaving Lorient.

Having to return to port time and again, each time justifying his reasons for a premature homecoming, became increasingly difficult for the sensitive commander. The commander began to feel very distressed, even shameful that he had not faced the enemy. Rumours began to circulate around Lorient concerning his competence and bravery. When allied to his mounting frustration at his lack of success, these rumours were having a serious impact upon his deteriorating mental health.

In early October 1943, Zschech took the boat to sea for the last time. On the 24th October 1943, following a harrowing depth charge attack, Zschech committed suicide by shooting himself in the head with a handgun. The First Watch Officer, Paul Mayer, assumed command and returned the boat to port.

The third commander - Harald Lange

With a history of technical frustrations, six aborted patrols, and the suicide on board of the unpopular commander, it was a frustrated and troubled crew which returned with the boat in November 1943. An experienced officer would be required to steady the ship and her crew. This was provided by Harald Lange, who at 40 years old was much older than the average U-boat commander.

The history of aborted patrols did not conclude with the passing of Zschech - Lange's first patrol with U 505 was cut short when a leak was found during the first practice dive. This was quickly rectified in port and the boat left again on patrol a few days later. Three days later the boat was ordered to divert on a rescue operation to pick up survivors of the torpedo-boat T25. During the return more technical issues prevailed when a fire started in the starboard electrical motor. Even when the boat did return to port, more bad luck prevailed when the starboard diving plane was damaged during docking.

Capture

In mid-March 1944 U 505 left on her final patrol. More technical issues persisted, this time in the form of a jammed bow cap and issues with the radar set. Then came the 4th June 1944, the famous

day when the boat was captured by Task Group 22.3 of the US Navy. The “hunter-killer” group, commanded by Captain Daniel Gallery, consisted of the escort carrier USS *Guadalcanal* and five escorts - USS *Pillsbury*, USS *Pope*, USS *Flaherty*, USS *Chatelain* and USS *Jenks*. The American ships and aircraft fired countless rounds of various calibres at U 505. In addition to the damage sustained during these attacks, U 505 was left circling clockwise following damage to the rudder by depth charges. Believing the boat to be sinking, Lange ordered the crew to abandon ship. However, due to injuries sustained by himself and other key officers, and the haste with which the crew abandoned ship, the scuttling charges were not set. An eight man party from the USS *Pillsbury* climbed aboard the U 505 to find the U-boat abandoned by her crew. Subsequently, the American sailors were successful in their efforts to save U 505 and managed to tow the boat back to Bermuda.

The museum boat

At Bermuda, the US Navy stripped out many key technical parts for evaluation. Later the boat was moved to Portsmouth Naval Yard, where it would ultimately be joined by other U-boats which were surrendered after the cessation of hostilities. In 1954, following complex negotiations, the boat was towed to the Museum of Science and Industry in Chicago. Over many years exposed to the elements, various restorations tried to allay the deterioration process. In order to ensure that the boat could be preserved without any further decline, a move indoors was deemed necessary. Following a \$35 million restoration project, this move was accomplished in 2004. U 505 currently resides within a temperature controlled underground enclosure which ensures the boat will last into the future years without deterioration. This will allow U 505 to remain as one of the best known U-boats, particularly when the story of her capture is told to future generations.

Only one other Type IX U-boat survives today. This is U 534, an IXC/40 boat which was sunk in 1945 and raised in 1993. The boat was transported to Birkenhead, near the English city of Liverpool, where the boat was on display for a number of years within the Warship Preservation Trust. Following the closure of this museum, the boat was transported to her current location at the Woodside Ferry terminal. Mostly infuriatingly, due to financial and technical reasons it was necessary to cut the boat into several separate sections. This was incredibly frustrating for U-boat enthusiasts as it leaves U 505 as the only complete Type IX in the world.

Part III - Pre-capture Modifications

The important early milestones for U 505 are as follows -

- laid down on 12th June 1940
- launched on 24th May 1941
- commissioned on 26th August 1941
- first patrol on 19th January 1942

Early features - The boat was built with an original Turm 0 tower (without any lower wintergarten platform). Between June 1940, when the boat was laid down, and the launch date in May 1941, more and more features were added to the boat. From the beginning U 505 had -

- one 105mm deck gun (10.5cm SK C/32 on a U-boat LC/36 mount) on the foredeck.
- one 37mm semi-automatic (3.7cm SK C/30 gun on a LC 39 mount) on the aft deck.
- one 20mm gun (2cm Flak C/30 gun on a L30/37 mount) at the rear of the bridge.
- no radar or radar detector equipment
- two air intakes on the tower.

Early modifications

Vent patterns - The distinctive variations in the free-flooding vents act as footprints that can help us identify a U-boat variant or, in many cases, the batch from which the boat originated. The author wrote an article – *Type VIIC Free-Flooding Vent Patterns* – to cover the VIIC variations (this article may be found in the downloadable pdf *The Wolf Pack: A Collection Of U-Boat Modelling Articles*). Coverage of the patterns on Type IXs can be found on page 26 of *Vom Original zum Modell: Uboottyp IXC* by Fritz Köhl and Axel Niestle. According to this book, the pattern on U 505 was the same on U 68, U 125-131, U 153-158 and U 503-512. Note that the vent directly in front of the diesel exhaust outlet, which is shown as one-half size in the book, was actually one-quarter size on U 505. In addition, the book shows four vents near the stern in the diagram but does not mention them in the table. The Revell kit successfully depicts the patterns for these boats so no modification should be necessary for building any of these boats. Other IXs have slight differences, as outlined in Köhl and Niestle's informative book, so some alterations would be necessary for other boats.

Breakwaters - Breakwaters were not fitted to the earliest IXAs when they were launched in the pre-war period. They were introduced in an attempt to reduce the amount of water splashing onto crewmen who were operating the 105mm deck gun. The first of the two breakwater features - the horizontal breakwaters - were fitted on either side of the deck, outboard of the 105mm deck gun. Although similar in position and purpose to the VII breakwaters, the IX version was a longer, thinner shape. The second feature was the vertical breakwaters, fitted directly in front of the deck gun. Photos do show the vertical breakwaters successfully preventing a rush of seawater from hitting the 105mm. On the downside, the vertical breakwaters may have induced some additional hydrodynamic drag and may also have been a hindrance during the loading of torpedoes into the forward torpedo hatch.

In some photos, IXs have the horizontal breakwaters at the sides of the hull but not the vertical breakwaters on the deck. Whether U 505 was originally outfitted with both sets is unclear. An order to removal this feature was issued on the 21st May 1941, three days before the launch of U 505. U 505 would almost certainly have retained the breakwaters when launched but it is also likely that they were removed by the time the boat was commissioned in late August 1941.



Above (3): The red arrows point to the three attachment points on the port side of the forward end of the foredeck. Along with the other three attachment points on the starboard side, they are what remained when the net cutters were removed from the bow of U 505.

Net cutters - A net cutter would have been installed at the bow of U 505. On the 1st March 1941, an order was issued for the net cutters to be removed. This feature would very likely have been removed from U 505 before the launch date in late May. Evidence of the net cutters remains on the boat to this day, in the form of the six attachment points that were left on the foredeck when the net cutter was removed.

Deck railings - The deck railing pattern also varied between boats. The patterns are also covered in *Vom Original zum Modell: Uboottyp IXC*, this time on page 17. The railings on U 505 are suitable for U 505 and U 506, with slight modification necessary for other boats. As will be covered later, modifications to the railings are necessary to depict U 505 at any point during or after capture.

Tripod jumping wire supports - When Type IXs had the original Turm 0 tower, there were no tripod supports for the aft jumping wires.

Insulators - As we move backwards along the forward jumping wire we meet a splitter, at which this point the wire splits into two separate wires. These two wires meet the top of the tower at an attachment point on either side. Each of these two distinct wires contained three insulator blocks. The earliest IXs also had a third wire which was connected from the splitter to the front of the tower; this third wire was mounted centrally and also included three insulators. U 505 was possibly built too late to have the third central set. If the boat did have the third wire then it was removed at some point early in its career.

Spray deflectors - The earliest IXAs did not have a spray deflector on the tower. This feature, mounted halfway up the front face of the tower, was introduced in 1939 prior to the start of hostilities.

Wind deflectors - A similar feature was the wind deflector flange, fitted at the top of the tower. Again, the earliest IXAs did not have this feature. The wind deflector was added to IXs much earlier than it was added to Type VIIIs. U 43 had the wind deflector before the start of hostilities so it appears that the implementation date of this feature upon IXs was 1939.

Given these dates it is clear that U 505 would certainly have both the spray deflector and wind deflector from the start.

Anti-vibration wires on periscopes - The earliest IXs had no anti-vibration wires around the top of the periscopes. Around 1940, these wires were added to the attack periscope to help reduce the wake left by a raised periscope. Although similar wires were added to the sky periscopes of U 38 and U 66, they may not have been added to the sky periscopes of other IXs such as U 505. Again, given the introduction dates, U 505 must have had this feature from the start.

S-Gerät

One of the active sound features under development was the *S-Gerät* (*Sonder-Gerät für aktive Schallortung* or “Special equipment for active sound location”). A bow device was fitted on the stem in readiness for when the equipment became available. The order to install this feature was placed on the 11th October 1940. However, it was decided that VIICs and IXs would not be fitted with the *S-Gerät* internal equipment after all. An order to remove the equipment was issued on the 24th April 1942. Rather than removing the bow device altogether, the boats with an existing bow device had this feature blanked off. Subsequently, the boats would have the blanked off feature removed altogether from the stem.

The following boats (of various types) had the *S-Gerät* without the blank plate on the following dates -

- U 551 - 14th September 1940
- U 559 - January 1941
- U 351 - March 1941
- U 128 - 31st July 1941
- U 374 - 10th May 1941
- U 458 - 4th October 1941
- U 441 - 12th January 1942

The following boats had the *S-Gerät* with the blank plate on the following dates -

- U 228 - summer 1942
- U 194 - 7th January 1943
- U 1060 - 8th April 1943

- U 390 - sometime following launch on the 23rd January 1943

An unidentified VIIC was launched in the winter of 1943 / 1944 with no *S-Gerät* bow device at all. This suggests that by 1944 the *S-Gerät* and blanking plate were completely removed from the stems of U-boats.

It is clear that U 505 would have had the *S-Gerät* bow device when launched on the 24th May 1941. From the dates above, the blanking off plate would have been added at some point after the removal order date of 24th April 1942. This might have been during refit 3X, which occurred between the 7th May 1942 and the 6th June 1942. The *S-Gerät* would have been completely removed by the winter of 1943 / 1944.

Tower versions

When Allied air attacks became a significant threat to U-boats, the High Command tried to combat this with the introduction of new or modified towers. U 505 featured three different types of tower during the course of her wartime career. Since a discussion of the conversion dates require us to be acquainted with each tower and its associated armament, the relevant details are listed below -

Turm nomenclature - When modifications were implemented on existing and new build boats, the nomenclature Bridge Conversion I, Bridge Conversion II etc. was used to refer to the modified or replacement towers. The term "Bridge Conversion I" is better known as "Turm I" (*turm* meaning tower in German). Since Bridge Conversion I came to be known as Turm I, and Bridge Conversion II became known as Turm II, the original towers would later become known as Turm 0. It was the Turm 0, with a single 20mm C/30, that U 505 had during the first few patrols.

It has been said that the *wintergarten* refers specifically to the lower platform on a Turm II or Turm IV bridge. This would mean that the upper Flak platform was not the *wintergarten* - only the lower platform was. Although the rear of the tower on an early Turm 0 tower is sometimes referred to as the *wintergarten*, in this article the term will *only* refer to the lower platform.

The term *Turm* is not specific to a U-boat variant, rather it is the *style* of tower that was fitted to different variants. For example, a Type VIIC and a Type IXC might both be equipped with a Turm IV tower. Although the towers would be outfitted with the same armament and the same platform arrangements, the difference in size between the variants means that the actual towers themselves would be slightly different sizes.

Turm 0 - The original form of tower that could be seen on the early Type IXs, such as U 505, and the early Type VIICs. This had a single 20mm C/30 behind the bridge and no lower *wintergarten* platform.

Turm I - Turm I was used on only a very few U-boats (possibly only U 193 and U 553) in 1942. It was intended to mount two 20mm MG 151 guns on a widened upper platform and a twin 20mm C/30 on a lower *wintergarten* platform. Since the twin 20mm was not yet ready, a single 20mm C/30 was mounted on the lower platform. Due to poor performance, and the positive results of the *Vierling*, which was being developed and tested at the time, Turm I was abandoned at the end of 1942.

Mittelmeerturm - Known as *Mittelmeerturm*, this modification to Turm 0 towers was used on VIIBs and VIICs operating in the Mediterranean. Noticeably longer than the standard early VIIC Turm 0, this tower featured two twin 13.2mm Breda machine guns (side by side in pressure tight pods) and a single 20mm behind. It did not feature upon Type IXs.

Turm II - Bridge Conversion II (known as Turm II) was used on a number of Type VIICs and IXs. The Turm 0 towers began to be modified to Turm II in December 1942. Turm II featured a single 20mm C/38 on the upper platform behind the bridge, and a single 20mm C/38 on a lower wintergarten platform. Note that the C/38 was an improvement upon the earlier C/30 gun.

Turm III - The intention with Turm III was to have a pair of single 20mms side by side on the upper platform and no lower platform. This was necessary for VIIDs so that the mineshafts would not be covered. Only a few boats (perhaps only VIIDs?) were outfitted in this fashion in April and May 1943. However, the initial intentions may have changed because late in the war the VIID U 218 had an upper platform as well as a lower, shortened lower platform which covered some of the mineshafts. The instructions in the Revell U 505 kit, which state that U 505 had a Turm III tower, are incorrect as Turm III was clearly never fitted to U 505.

Turm IV - Turm II was only an intermediate solution until suitable armament was available. It had been decided on the 14th November 1942 that it would desirable to have a Turm IV arrangement consisting of a pair of twin 20mm C/38s (mounted side by side) on the upper platform, and either a quadruple 20mm (*Vierling*) or 37mm automatic on the lower platform. None of these weapons were available so boats had to make do in the meantime with Turm II towers.

When such armament became available in 1943, U-boat towers were modified from Turm II to IV. The process of modifying existing towers to Turm IV began around the spring of 1943 or so. The 37mm automatic was not available when the Turm IV towers were first installed, so Vierlings were fitted initially.

Turm identification - To distinguish between a Turm II and Turm IV we need to look at the upper platform. If there is only one gun then it is a Turm II. If there are two separate gun mounts then it is a Turm IV. Note also that to accommodate an extra gun, the upper platform on a Turm IV was wider than the upper platform on a Turm II.

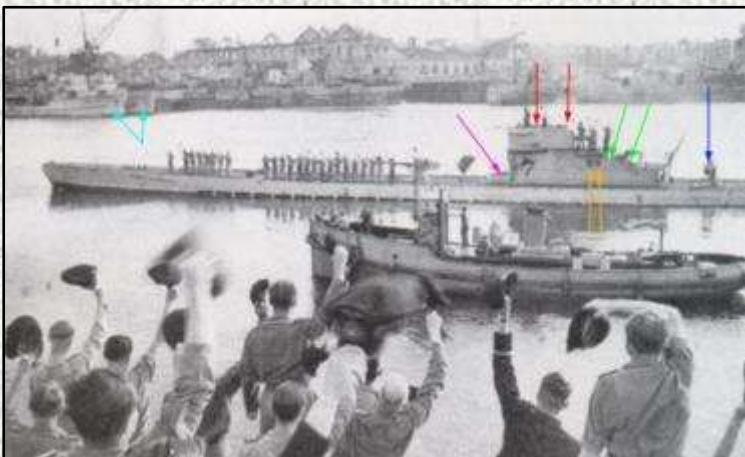
Below (4): The “well wishers” photo, which was the subject of continued debate on the AMP forum. It *appears* to show the boat departing or returning from patrol but appearances can be deceptive. The coloured lines were added to the photo by the author to illustrate to the reader certain points of discussion.

The “well wishers” debate

Now that we know a little background knowledge on the Turm variants, we can apply this knowledge to our study of U 505.

U 505 had the Turm 0, Turm II and Turm IV at various points but exactly when were these towers introduced on our chosen boat?

The excellent *Hunt And Kill: U-505 And The U-Boat War In The Atlantic* includes chapters from renowned historians. It includes a photograph which is key to determining when the towers were fitted. The caption for this photo in *Hunt And Kill* states “Cheered on by well-wishers, U-505 leaves for a war patrol to the



distant Caribbean on October 4, 1942.” As can be seen by the photo (photo 4), the axe insignia - covered later in the paint colours section - ensures that this boat is definitely U 505. Note that the boat retains the 105mm deck gun on the foredeck and the 37mm on the aft deck.

We can tell that U 505 has a Turm II in this photo for the following reasons -

- The tower is noticeably longer than a Turm 0.
- There is a 20mm on the upper platform and a 20mm on the lower platform. Although we cannot see any intricate detail, we can at least see that the gun on the lower platform is not a Vierling or the later 37mm automatic.
- The two dark rectangles on the tower sides, directly below the upper platform, are intakes for the diesel engines (the orange arrows point directly to the two rectangles). These were present on Turm 0 and Turm II but they were not present on the Turm IV tower.
- We can see there are actually three levels on the tower in this photo - the upper bridge level, a short step directly behind, and the lower wintergarten level at the rear. The green arrows point to the start and end of this middle level. Turm II towers on Type IXs had these three levels, whereas the Turm IIs on VIICs had only two levels. Turm IVs on Type IXs and VIICs both had only two levels.

In the foreground men can be seen waving their caps in support of the U-boat men, who are returning the salute in similar fashion. This scene is entirely typical of a U-boat either departing or returning from patrol, and would not normally occur when a boat was leaving for a practice dive in the harbour. It therefore *appears* to show U 505 either departing or returning from a patrol.

Since U 505 Turm II photos are in short supply, establishing the date when it was taken is absolutely paramount in determining when the Turm II was fitted. So when was it taken? As previously mentioned, the caption in *Hunt And Kill* asserts that the boat is destined for the Caribbean patrol on the 4th October 1942. Although *Hunt And Kill* is a fantastic resource, written by accomplished authors and knowledgeable experts, the date is, I believe, erroneous. Photo 2 clearly shows the boat following the Hudson attack (the damage on the aft deck leaves no doubt as to the period when this photo was taken!). If we scrutinise the aft deck very carefully, we can see there is no evidence of any lower wintergarten. Another photo in both books (not reproduced here) shows crewmen dressed in swimming trunks enjoying the Caribbean sun; this shows a Turm 0 tower, again with no wintergarten. Logic dictates that there is a contradiction here - the photos showing U 505 with no wintergarten during patrol 4 ensure that the boat *cannot* have had a Turm II when it departed on this same patrol. It follows that the Turm II must have been fitted during a subsequent refit, with the obvious candidate being 5X.

Following the Caribbean patrol, U 505 spend the period between the 13th December 1942 and the 30th June 1943 in refit 5X. On page 79 of *Hunt and Kill* it is stated that the entire conning tower was replaced, and that the armament on this new tower comprised of two twin 20mms on the upper platform, and the Vierling on the lower wintergarten platform. This is the early armament fit for a Turm IV so it is clear that the authors believed that a Turm IV had been fitted in refit 5X. In *Steel Boats, Iron Hearts: A U-Boat Crewman's Life Aboard U-505* by Hans Göbeler, the former U 505 crewman states –

“By late May of 1943, the modifications and repairs on our boat were almost complete. Gone are the large gangs of shipyard workers in their thick brown welder’s suits. Only a few technicians were to be still found aboard finishing some small details. *U-505* sported a totally new silhouette. We were especially excited to stand on the spacious *Wintergarten*, with its deadly looking quad barreled flak gun. Combined with the two twin-barreled 20mm guns on either side of the conning tower, our new boat now boasted a total of eight 20mm guns for anti-aircraft defense. At least now, we thought, we would have a fighting chance against any enemy birds trying to drop an egg on us.”

Both books assert that the Turm IV was fitted by the end of refit 5X, with one book even being specific enough to state a late May completion date. Given that the authors of *Hunt And Kill* had the boat’s KTBs (the war patrol diaries, which may not have detailed the exact changes but would often specify the dates in the shipyard), and that *Steel Boats* was written by a former

crewman who served on every U 505 patrol, then it is extremely likely that the Turm IV was indeed fitted by the end of 5X. This also accords with the timeframe when the Turm IVs were introduced to other boats in the *U-bootwaffe*.

So, at this point in the argument, it would seem extremely likely that the Turm IV, with two 20mms on the upper platform, and a Vierling on the lower wintergarten platform, had been fitted by late May 1943. The “issue” which remains is with photo 4, the “well wishers” photo showing U 505 apparently departing on patrol 4 with a Turm II. We shall consider the following -

- Patrol 4 was undertaken with a Turm 0
- Turm II was fitted after Turm 0
- Turm II had to be fitted before Turm IV
- By the end of refit 5X Turm IV was in place

However, in the period between mid-December 1942 (start of refit 5X) and late May 1943 (completion of Turm IV), U 505 did not undertake any patrols. So how can photo 4 show U 505 departing on patrol with a Turm II?

The logical conclusion is that conversion of Turm 0 to Turm II, and conversion of Turm II to Turm IV, were *both* completed within refit 5X, and that the “well wishers” photo does not show the boat departing on a war patrol. In fact, given the information at our disposal (refit dates, patrols dates, photographic evidence and the information in the two books), the boat *cannot* have sailed on a war patrol with a Turm II.

Despite photo 4 looking like a classic *Das Boot* style departure, with adoring well wishers urging happy hunting, it has to show the boat on a more mundane form of short passage. Let us study photo 4 once again, this time with no preconceptions about what may or may not be occurring. It is virtually certain that photo 4 shows U 505, and it is certain that a Turm II features in this photo. Due to the crowd waving to the crew assembled on the foredeck, the photo *appears* to be a classic image of a boat returning or departing from patrol. But are we *certain* that this is the case?

Despite appearances there is nothing to *prove* this photo shows U 505 leaving on patrol. It may seem unlikely, at first, for this scene to be enacted for anything less than a full war patrol but let us explore possible scenarios. During an extended stay in the shipyard, a diesel engine, most of the aft deck and the entire tower had been replaced. At some point the boat would have sailed to test the systems. Being a submarine, it was especially necessary to undertake a practice dive to ensure that all the diving systems were functioning correctly. They may also have wished to test out the new armament fitted to the two platforms. Next we can consider the crew. Having returned from the Caribbean patrol several months previously, the well rested crew may have required refresher training. On board training for new members of the crew might also have been desirable. Next we may consider that the men doffing their caps may not have known the boat was sailing on a practice run and might have assumed the boat was destined for a war patrol. Regardless of destination, the men may have simply waved to a passing U-boat, in the same manner that people may wave to a passing ship. Lastly, could this photo have been staged for propaganda purposes?

Not only do we have cause to doubt the caption date in *Hunt & Kill*, we now have serious reason to question the assertion that it shows the boat leaving on patrol. Errors with dates and the identity of U-boats are rife in U-boat literature, with only a select few being free of error. The authors of *Hunt & Kill* are highly competent authors and scholars but every U-boat researcher has had cause to reassess their previous assumptions when new information becomes available.

Can we find a reason why *Hunt And Kill* might be incorrect with the “well wishers” caption? Firstly, the authors may have been influenced by *Steel Boats*, which also includes this controversial photo. The photos in Göbeler’s book appear to be deliberately placed at a point where they are directly relevant to the topic being discussed. Although Göbeler does not provide a date for this photo, its presence at the point where Göbeler discusses the departure on patrol leaves the distinct

impression that the author, or perhaps editor, of the book thought that photo 4 was taken on the 4th October 1942.

We may wonder why the authors of both books did not query the lack of Turm II after the Hudson attack. After all, photos in both books clearly show no lower platform on patrol 4. Why did they not spot the contradiction?

One of the factors may lie in the whereabouts of Hans Göbeler when the Turm II was being fitted. Hans saw the boat in late December 1942, and was surprised to see his boat minus a conning tower. At this point the Turm II had yet to be fitted. He was given three weeks' leave in late January 1943. When he returned from Germany to Lorient, he went with the rest of the crew to the boat's sponsor city of Schliersee in Bavaria and then to a U-boat recreation place at a ski resort south of Munich. He returned along with the crew in late February 1943. Following this period, rather than sleeping on board, he would have stayed at the *Lager Lemp* U-boat facility outside the city of Lorient. In early March Hans was sent to the anti-aircraft gunnery school at Mimizan, returning in mid-March. It is just possible that the Turm II was in already in place by mid-March, and that Hans was in Mimizan when the sailing in photo 4 took place. However, it is more likely that he was present aboard the foredeck in photo 4 and would, for a short time, have seen U 505 with a Turm II. At the very least, Hans would not have seen the boat with this intermediate tower for long.

Another relevant point is that the identification of Turm II towers is so often neglected by enthusiasts. Many people have mistaken a Turm IV for a Turm II, and indeed others have no knowledge of the Turm II at all. It is very possible Göbeler had no recollection of the Turm II when he wrote his book so many years down the line. It is equally likely that Turm IIs were not foremost in his mind at this time. Either way, he may not have been best placed to notice the lower wintergarten contradiction in the patrol 4 photos.

The authors of *Hunt And Kill* (who referenced *Steel Boats*) would probably have been influenced by the position of the photo in Göbeler's book. Once again, the identification issues surrounding Turm II towers may have come into play again. And once again, the contributors to *Hunt And Kill* may have ranked other topics as more important than Turm II identification.

To conclude, the authors of *Hunt And Kill* knew that a Turm IV had been fitted in refit 5X, and the photo *appears* to show the boat departing on patrol with a Turm II. They may have not noticed the contradiction in the patrol 4 photos, and assumed, quite understandably, that the photo had to show the boat departing on the patrol directly before refit 5X (patrol 4 in the Caribbean).

Fitting of Turm II

U 841 was expected to go on patrol in late June / early July 1943 with a Turm II. However, the boat did not sail and the tower was changed from a Turm II to Turm IV. This is one example of another boat being changed from Turm 0 to Turm II, then Turm II to Turm IV, all within one refit period.

The major repairs that were necessary after the Hudson attack, the change to Turm II, and then a further change to Turm IV, would partially explain this prolonged period in the first half of 1943 when no patrols were undertaken. Given the duration, the Turm II may have been fitted in April 1943, perhaps slightly earlier, in March. This would allow enough time for the major repairs to the aft deck and engines to be completed and the fitting of the Turm II itself.

As for other boats, the conversion of Turm 0 to Turm II did not occur overnight. This is backed up by the following information -

- U 125 went to sea in late February 1943 with a Turm 0
- U 135 went to sea in June 1943 with a Turm 0
- U 185 still had a Turm 0 on the 24th August 1943

It is possible that some boats, such as U 185, did not receive the Turm II at all, and were converted from a Turm 0 directly to a Turm IV.

Modifications during first stage of refit 5X (with Turm II)

Covers for torpedo storage tubes - Type IXs were fitted with eight pressurised storage tubes for spare torpedoes. These were housed in the channels running down either side of the deck. The covers for the tubes varied, with at least three types being used.

The first type, evidenced on pre-war photos of U 37, had a semi-circular bulge along top. This pre-war type was not widely used, and perhaps only featured on the very earliest Type IXs. The second type of cover was made of metal, with around 33 thin grooves and 5 rows of circular holes running along the length, and anti-slip bumps on the surface. The third type consisted of 7 wooden planks running along the length of the cover. Boats tended to have a mixture of metal and wooden covers, with the positions varying among boats.

When commissioned, the boat had wooden planks in the channels just aft of the tower, and metal covers on either side of the 37mm semi-automatic. This arrangement was changed, probably as a direct result of the Hudson attack, to one metal cover on either side of the deck (just outboard of the lower wintergarten platform) and wooden planks elsewhere. During the capture, the metal cover on the port side of the deck was damaged. It was jettisoned overboard along with the damaged torpedo underneath. At some point following U 505's transit to Chicago, the deck was restored or replaced. The two metal sections on either side of the wintergarten were not replaced with the correct metal type but with the wooden planking type.

Despite these differences, it should be noted that the Revell kit correctly depicts the torpedo storage tube covers at the time of U 505's capture.

Tripod jumping wire supports - The aft jumping wires on the early Type IXs (with the Turm 0) extended back from the bridge to the aft deck, without any need for any tripod supports. When the lower wintergarten platform was introduced, the rear jumping wires extended back from this lower platform to the top of the tripod supports and then into the deck farther back. The tripod supports were presumably added near the stern to raise the level of the jumping wires. Fitted in the initial phase of refit 5X, this style of supports was retained and feature on the boat at present.

FuMO 30 box - The two red arrows in photo 4 point to the top of a box added to the port side of the tower to house the FuMO 30 radar mattress antenna. This could be extended out of the box and rotated by a crewman inside the boat. More details of the radar can be found in Part IV of this article.

Hydraulically extendable mast antenna - Like many VIICs, the early Type IXCs had a fairing on the port side of the tower to house a hydraulically extendable mast antenna. On the VIICs the housing was a rounded shape, whereas on the IXCs the fairing was smaller and almost akin to a rounded triangle. This antenna was in the exact position taken by the FuMO 30 box so it is likely that the radar displaced the mast antenna in refit 5X. The hydraulically extendable shaft formerly used to raise the mast antenna may have been used to raise and lower the mattress radar antenna.

The order to remove the rod antenna and install the fairing for the FuMO 30 was issued on the 19th November 1942.

Air intake grill - Before the implementation of the FuMO box, there were two horizontal intake grills on IXCs, mounted at the top of the rear of each tower bulwark. The mast antenna had been situated directly in front of the port intake grill. When the FuMO box was installed it would have resulted in the removal of the port intake grill. It might be assumed that two intakes were required, one for each diesel engine. However, there is a precedent for one intake grill. On VIIBs, which had persistent difficulties with their intakes, the final result (for VIIBs in 1941 and 1942) was a single teardrop-shaped intake directly behind the attack periscope base. This single intake must have

sufficed for both diesel engines on VIIBs. Given that no other intake appears to be present in photos of the present day U 505, it looks likely that the boat was also reduced to one horizontal air intake in refit 5X.

Note that when the Turm II was implemented, U 505 still had intakes on the vertical walls of the tower (see orange arrows in photo 4). When the Turm IV was implemented later in refit 5X, the new tower did not have these vertical intakes and the boat was left with one horizontal intake, at the top of the rear of the starboard tower bulwark.

Armour plate - In order to provide some protection against machine gun fire from attacking aircraft, 16mm thick armoured plate was added to many U-boat towers above the spray deflector. It does **not** appear that U 505 was fitted with this plate.

Mountings for removable machine guns - Quite a number of photos show U-boats with machine guns mounted at the top of the tower bulwarks. The machine guns, which included MG15, MG34 or MG81 types, were kept inside the boat and only brought out and mounted when they were to be used. Usually, but not universally, Type VIICs would feature two mounts and Type IXs would feature four mounts. It is likely that U 505 would have received four mounts but it is unclear when they would have been fitted. U 517 had the mountings on the bridge by October 1942, so a fitting date of 4X or 5X is possible for U 505.

37mm replacement - Since the original 37mm (3.7cm SK C/30 gun on an LC 39 mount) was blown clear off the aft deck during the Hudson attack, a replacement was necessary. In photo 4 we can see that U 505 did have a 37mm semi-automatic at the time a Turm II was present. But we can see the new mount is conical shaped, much like the mount we see in many photos of 20mm guns at the rear of Type VIIC towers. The weapon fitted early during refit 5X may have been a 3.7cm SK C/30 on an L30/37 mount.

Other modifications around the 5X refit period

Diesel exhaust outlet - There were changes made to the diesel exhaust outlets on the hulls of Type IXs. When captured, U 505 had a shroud over the diesel exhaust outlets. This outlet style can be seen on some early Type IX hulls so it is possible that U 505's outlets may not have been modified over time.

KDB removal - U 505 would probably (but not certainly) have been originally outfitted with a KDB (*Kristalldrehbasis Gerät*) device. This consisted of a rotating T-shaped piece with six acoustic listening devices (hydrophones). Housed on the foredeck, this rotating device could be extended or retracted into the deck. Used in conjunction with the *Gruppenhorchgerät* (GHG, group listening apparatus), the KDB was effective only at slow speeds. It is perhaps this limitation which led to a removal order on the 24th April 1942. The first refit after this order was 3X so it may have been removed at this time. Note that U 172 retained the KDB by commander's request.

Armoured boxes (coal scuttles) - Following an order issued on the 4th June 1943, armoured boxes (*Kohlenkasten* - coal scuttles) were fitted to *some* towers to protect lookouts from aircraft fire. Generally the port box was to house one crewman, while the starboard box was to house five men. Due to the presence of the FuMO box on the port side, the port coal scuttle was smaller and was mounted directly ahead of the FuMO box. U 868 was one Type IX which had the coal scuttle boxes. Since the excessive weight of the boxes reduced the stability of boats in high seas, an order was issued on the 30th October 1943 to remove the boxes.

No evidence has yet surfaced that U 505 was fitted with the coal scuttles.

Armoured doors - On some Type IXs, armoured doors were fitted to separate the bridge from the upper platform. Again, no evidence has yet surfaced that U 505 was fitted with this feature.

Fitting of Turm IV

If the fitting of the Turm IV was nearly complete by late May, then it is likely that the process of conversion of Turm II to Turm IV took place throughout May. It has been said that this conversion process included removing existing towers and completely replacing them with new pre-fabricated towers. If this is correct, then refit 5X would have seen the entire removal and addition of several types of tower in the following order: Turm 0 removed; Turm II inserted; Turm II removed; Turm IV inserted.

When U 841 was changed from Turm II to Turm IV, the interrogation report states that the lower wintergarten platform was removed and a pre-fabricated, larger and stronger lower platform was fitted. This suggests that the entire Turm II was not exchanged for a Turm IV on U 841, and that only a *pre-fabricated lower platform* was introduced. This information may not be relied upon since the upper platform, which was wider on a Turm IV than a Turm II, would also need modified or replaced.

According to Hans Göbeler in *Steel Boats* -

“On July 1, U-505 was moved to a wet dock in the bunkers. With her new and much larger conning tower and fresh coat of dark grey paint, she was unrecognizable as the same boat that had limped into harbor more than six months earlier.”

This suggests that the boat was out of dry-dock and into the bunker by the start of July 1943.

Modifications during last stage of refit 5X (with Turm IV)

Removal of deck gun from foredeck - At the start of the war, the deck cannon (88mm on VIIs and 105mm on IXs) were used reasonably frequently to sink ships and to preserve valuable torpedoes for future attacks. By 1943 the opportunity to sink Allied ships using the deck gun was massively reduced. On the 27th April 1943, an order was issued to remove the 88mm from Type VIICs. Presumably this also applied to the removal of the 105mm from Type IXs. The 105mm was removed from U 505 in the last stage of refit 5X.

When the 105mm was removed from U 505, the 105mm ammunition rack was also removed from the underside of the foredeck. Despite being superfluous to requirements, the strips around the gun, which helped crewmen keep their feet when operating the gun in high seas, were retained on the deck.

Although this did not occur on U 505, some IXs were fitted with a 37mm semi-automatic (3.7cm SK C/30 gun on a LC/39 mount) on the foredeck in the position vacated by the 105mm. This was the case on U 515, U 860 and U 873. When U 172 returned from patrol on the 7th September 1943, the shipyard changed the 105mm for a 37mm semi-automatic. A member of the crew objected so the shipyard personnel were forced to reinstate the 105mm on the foredeck. When U 172 left on patrol on the 22nd November 1943, the boat had an unusual combination of Turm IV, Vierling and 105mm. U 841 also went on patrol with this combination on its last patrol but the 105mm was due to be removed when they returned from this patrol.

On some IXs (such as U 168) undertaking long range patrols to the Far East, where there might be an opportunity to use the deck cannon, the 105mm was retained on the foredeck.

Additions to upper platform - When the Turm IV was installed, a pair of twin 20mms (2cm Flak Zwillig C/38 II on an M 43 U mount) were added to the upper platform. These weapons did not feature an armoured shield.

Addition to lower platform - When the Turm IV was installed, a four-barrelled 20mm Vierling (2cm Flak Vierling C/38 on an M 43 U mount) was added to the lower wintergarten platform.

Removal of 37mm from aft deck - When the Turm IV was installed on U 505, the new 37mm semi-automatic (3.7cm Flak 42 gun in L30/37 mounting) was removed from the aft deck.

Ammunition containers - When the Turm IV was installed, water- and pressure-tight ammunition containers were fitted to both platforms. On the upper platform, mounted centrally at the rear of the platform, there was one circular ammunition container encased within a small D-shaped box. On the lower platform there were two containers to the starboard side; these circular containers were mounted together in a row and encased within a larger D-shaped box (the straight edge was aligned with the edge of the wintergarten, the rounded edges were inboard). Also on the lower wintergarten platform, this time on the port side, were three circular containers that were also arranged in a row and mounted together in a larger D-shaped box.

Lattice mesh grill - When the Turm IV was installed, a lattice mesh grill was fitted on both sides to the lower half of the upper platform tower railings, directly below the three wooden seats per side. Some other boats received the lattice mesh on the lower platform as well.

Background information on Turm IV and Vierlings

U-Boot Im Focus 9 contains a superb discussion of the changes to the anti-aircraft armament in the *U-bootwaffe*. For more details readers are directed to this highly informative issue of the magazine. The *U-Boot im Focus 9* article provides us with the following information (the text in square brackets is from the author) -

- Vierlings were first ready for experimental purposes in March 1943, and fitted to boats in April and May.
- In the April and May period, the second boat was due to have been fitted with a 37mm automatic but this was not yet ready.
- Production of the Turm IV with Vierling was increased in mid-May; 50 Turm IVs were due to have been delivered in June, and 150 in July [it is unclear if these numbers were actually delivered].
- Conversion to Turm IV and Vierling began in early June, with operational boats getting first opportunity.
- On the 14th June 1943 an order was issued stating that no U-boats should leave from Atlantic ports without twin 20mms. Since Vierlings were mandatory for Atlantic boats at this point, this effectively meant that a Turm IV was mandatory as of mid-June 1943. [This is earlier than August 1943, the period when others books state that boat were not allowed to go on operations without a Turm IV tower]
- As a direct result of the June 1943 order, U-boats were delayed from sailing on war patrols in the late June / early July period.
- Boats operating on a war patrol without a Vierling were actually recalled to Norwegian ports.
- The effectiveness of the Vierling was betrayed by its lack of range. It was to be replaced by the 37mm automatic when the longer range, larger calibre weapon became available.

The decision to recall boats from patrols if they did not have the Vierling seems, at first, quite drastic. However, this decision becomes comprehensible when we recognise that it was made in the period directly following Black May. During the infamous month of May 1943, at least 40 U-boats were sunk. The events of that infamous month resulted in BdU withdrawing almost all boats to port. Tactical and technological changes were implemented to try to wrench the upper hand back from the Allies, though this ultimately proved to be impossible.

The information above makes it clear why conversion from Turm II to Turm IV was considered necessary before U 505 left on patrol in the summer of 1943.

Change from Vierling to 37mm automatic

When the Vierling did not rise to expectations, this four-barrelled weapon was changed to a single 37mm fully automatic weapon (3.7cm M 42U gun on LM 42U mount). This automatic weapon, fitted on the lower wintergarten platform, should not be confused with the 37mm semi-automatic which had previously been present on the aft deck.

The new fully automatic weapon had a greater range than the Vierling and proved to be much more effective. The 37mm on the lower platform, and the twin 20mms on the upper platform, became the standard fit for IXs, VIICs and VIIC/41s until the end of the war.

In *Steel Boats*, Hans Göbeler refers to the period after patrol 6 by stating -

“For the next two weeks, our boat underwent repairs. They also replaced our huge four-barreled anti-aircraft gun with a newly designed single barreled *Oerlikon* 37mm automatic cannon.”

If Göbeler is correct, then the 37mm automatic was fitted during refit 7X (14/07/43 to 31/07/43).

However, other sources suggest that the 37mm was introduced later in the year. According to Eberhard Rössler in *The U-Boat: The Evolution And Technical History Of German Submarines*, the 37mm automatic was ordered on the 15th October 1943. In Robert C Stern's *Type VII U-Boats*, the author asserts that that the 37mm automatic “finally began” to be fitted in November 1943, with 18 boats being fitted by the start of December.

When U-boats were sunk, the Allies would interrogate any survivors. Many of the interrogation reports are available to us (at www.uboatarchive.net) and provide excellent information on technical and operational details. The following information about 37mm automatic fitting dates can be gleaned from these interrogation reports -

- U 68 - 37mm fitted after end of penultimate patrol (after 23rd December 1943).
- U 172 - still retained the *Vierling* when it departed on its final patrol on 22nd November 1943. Had the boat returned, it would have received the 37mm in the next refit.
- U 177 - 37mm fitted just after the middle of December 1943, prior to sailing on final patrol on the 2nd January 1944.
- U 257 - 37mm fitted between end of penultimate patrol (14th September 1943) and start of final patrol (2nd January 1944).
- U 515 - 37mm fitted after end of penultimate patrol (after 14th January 1944).
- U 744 - 37mm fitted between end of penultimate patrol (15th January 1944) and start of final patrol (24th February 1944). Note: Turm IV had been fitted at the end of September 1944.
- U 801 - 37mm fitted between end of penultimate patrol (8th January 1944) and start of final patrol (26th February 1944).
- U 841 - departed on first patrol on 4th October 1943 with a *Vierling*. Boat was sunk during this patrol so there was no opportunity to fit a 37mm.
- U 845 - 37mm fitted at the end of 1943.
- U 1229 - 37mm fitted in mid-July 1944.

The interrogation report of U 177 states that the “37 mm full-automatic gun was introduced to the U-boat arm about November 1943”. U 177 had returned from its penultimate patrol on the 1st October 1943. At that time, a pair of twin 20mms were added to the upper platform, but it was necessary to add a *Vierling* to the lower platform of U 177 because a 37mm was not available. The reports states: “The 37 mm. gun could not be procured until the last days before sailing and a quadruple 20 mm. gun was mounted for use in gunnery exercises.” The 37mm was fitted in a three day period in La Pallice, just after the middle of December 1943, and the boat sailed on its final patrol on the second day of 1944.

This information suggests that the 37mm automatic was not normally fitted in July 1943. For Göbeler’s information to be correct, U 505 would have to have been fitted with a 37mm automatic a full three months before the order was placed to fit them to boats. There is one precedent of a boat sailing before the order date - the VIIC U 707 had the 37mm when it sailed on patrol on the 12th October 1943, three days before the order was issued. However, a full three months before the order, as suggested by Göbeler, would require U 505 to have been evaluating the 37mm under combat conditions. So far no information has come to light to confirm that U 505 was used in an experimental capacity, but the possibility cannot be ruled out.

According to the conventional dates, the most likely date for U 505 to have been fitted would be refit 12X (8th November 1943 to 20th December 1943).

37mm ready container - When the 37mm automatic was introduced, a ready container was also fitted to the starboard side of the tower. Consisting of a long thin tube, it housed a replacement barrel for the 37mm weapon. This ready container feature could be found on other boats, such as U 977 when it sailed to Argentina.

37mm training - When the 37mm automatic was fitted, crewmen were required to attend a suitable training course. This was conducted during a Flak specialists’ gunnery course, either in the Baltic port of Swinemünde or at Mimizan in the south-west of France. Hans Göbeler had attended a two-week course at Mimizan in early March to learn the rudiments of the 20mm Vierling. The training for the 37mm was reputed to have been conducted during a four-week course.

Late modifications

Balcongerät - This system consisted of 48 hydrophones in a round dome at the bottom of the stem. It was standard on XXIs and was fitted to some VIICs, VIIC/41s, and IXs in 1944 and 1945. The IXC/40 U 194 was the test boat for this device, and it was in place on this boat by January 1943. U 505 received the *Balcongerät* in refit 14X (2nd January 1944 to 16th March 1944). All Lorient boats were expected to receive this in due course.

Rudder support - As with other boats of the period, U 505 was launched with an A-shaped support bracket. This was connected to the bottom of both rudders and ran forward to the thick support bar near the stern. This was removed on late war boats and was not present on U 505 on her final patrol.

Part IV - Radar & Radar Warning

The implementation of radar aboard U-boats first began in summer 1939, when the IXAs U 39 and U 41 were fitted with a radar set from the GEMA manufacturer. But it was not until 1942, when air attacks were beginning to be suffered by the *U-bootwaffe* in earnest, before this field of technology was given the full attention it deserved. Radar and radar warning became increasingly important in the Battle of the Atlantic and it was not long before it became essential for survival.

In the following sections, our discussion will be limited to a brief coverage of the types, the time period when they were fitted, and the types of antennae used on the towers. We will cover the types in service when the boat operated during war patrols (pre-capture) and the types in use after the boat was captured (post-capture). These have been broken down into different sections to ensure there is clarity between what systems the boat did have and what systems the boat might have had after capture. Different text colours have been used to illustrate the differences. These are -

⊕ Black text	General information (not specific to U 505)
⊕ Blue text	Equipment used aboard U 505
⊕ Dark red text	Equipment that would possibly have been installed on U 505 had the boat remained in Kriegsmarine service until the end of the war.
⊕ <u>Green headings</u>	Radar or radar warning sets (internal equipment)
⊕ <u>Purple headings</u>	Antennae (external equipment)

The Kriegsmarine used the following codes -

- FuMO (*Funkmessortungsgerät* meaning bearing taking apparatus) - radar equipment
- FuMB (*Funkmessbeobachtergerät* meaning radar warning apparatus) - radar warning receiver equipment
- FuMB Ant - the antenna associated with the FuMB radar warning receiver equipment

Radar (pre-capture)

FuMO 29 Seetakt - Also known as GEMA, from the firm which originally manufactured the set, this consisted of two rows of six dipoles fixed to the front of tower, above the spray deflector. The upper row of dipoles were for transmitting, the lower row for receiving. These dipoles are clearly visible in some photos, while in other photos the dipoles are hidden by a cover or shield. First tested in late 1941, installation upon operational boats began in 1942. Photos show a number of Type IXs were fitted with this radar equipment.

At present there are no photos in common circulation showing U 505 with this radar. Given that FuMO 29 was not present during patrol 4, and FuMO 30 was fitted early in refit 5X, there does not appear to be a time window when U 505 could have had this set.

FuMO 30 Seetakt - Introduced in late 1942 and early 1943, the internal equipment within the FuMO 30 was much the same as the FuMO 29. However, a completely different antenna made the system far more effective than its predecessor. The aerial consisted of a large rectangular mattress-style antenna, with two four-dipole rows, housed in a box on the port side of the tower. This rotatable antenna could be extended or retracted into the box.

This was augmented by the introduction of dipoles belonging to the FuMB Ant 5 *Samoa* antenna (the *Samoa* dipoles were added to the back side of the FuMO 30 mattress, and are characterised by four near oval shaped pieces, arranged in rows of two at a 45 degree angle).

U 505 refit 5X (13/12/42 to 30/06/43) - FuMO 30 radar installed. It is unclear when the *Samoa* dipoles were added.

Radar (post-capture)

FuMO 61 Hohentwiel U - The existing FuMO 30 radar would have been replaced with FuMO 61 *Hohentwiel U*. Identical in size to its predecessor, the rectangular *Hohentwiel* mattress antenna housed two six-dipole rows and would have been housed in the same location vacated by the FuMO 30. Evaluation of the *Hohentwiel U* began in August 1943, while production began in late 1943.

The new radar was first introduced in March 1944 and 64 U-boats were fitted with this improved radar by the 17th September 1944. This *Hohentwiel U* was augmented by dipoles belonging to the FuMB Ant 4 *Sumatra* antenna on the back side of the mattress.

U 505 - It is likely that U 505 would have been fitted with this set in the refit that would have followed patrol 14.

Radar warning receivers (pre-capture)

Note 1: Radar warning receiver sets are in green headings, antennae are in purple headings.

Note 2: There are discrepancies between the fitting dates of radar warning receivers. The conventional dates are provided in the blue text and the tables. Göbeler's fitting dates are provided at the end of this section.

FuMB 1 *Metox* - Although radar had been fitted to British aircraft since November 1940, it only began to appear in large numbers by 1942. By the summer of 1942 it was a serious threat to U-boats and countermeasures were necessary. On the 26th August 1942, an order was issued to fit radar warning receivers to all U-boats. The first radar warning receiver on U-boats was the FuMB 1 *Metox* (*Metox* being the French company which first manufactured the set). This was trialled in July 1942, and fitted on operational boats beginning in August 1942. By December 1942 the whole fleet had not yet been fitted. By mid-May 1943, BdU began to appreciate that Allied aircraft were homing in on emissions radiated by the *Metox* equipment itself, and banned use of the *Metox* in August 1943.

U 505 refit 4X (25/08/42 to 03/10/42) - *Metox* installed along with the FuMB Ant 2 *Biskayakreuz* antenna.

Note: The original FuMB 1 *Metox* (600A) may have been upgraded or replaced with FuMB 2 *Metox* (R.87) at some point.

FuMB Ant 2 *Biskayakreuz* antenna - The Biscay Cross (*Biskayakreuz*) antenna (also known as *Honduras*, referred to as "Southern Cross" in interrogation reports) for the FuMB 1 *Metox* radar warning receiver was an improvised structure made of wood and wire. It was mounted on a bracket on the attack periscope base, and brought into the boat every time the boat dived. This antenna proved effective but due to its rudimentary nature, and the requirement to be moved in and out of the boat, it was prone to breakage.

U 505 refit 4X (25/08/42 to 03/10/42) - *Metox* installed along with the FuMB Ant 2 *Biskayakreuz* antenna.

FuMB 8 *Wanze G1* - Due to an urgent requirement to replace the *Metox*, a new radar warning receiver - the FuMB 9 *Zypern* (also known as *Wanze*, or sometimes as *Hagenuk*) - was rushed into use in August 1943. Due to the immediacy with which *Wanze G1* was introduced, inevitably corners were cut during the design and evaluation process. In due course it became realised that this set also radiated emissions. The *Wanze G1* was banned on the 5th November 1943 and replaced with the *Wanze G2*.

Wanze would normally use the FuMB Ant 3 *Bali I* antenna but the *Wanze* could be connected to the Biscay Cross if required. Even after the introduction of *Wanze G1*, and the *Bali* antenna, the Biscay Cross was often carried inside the boat as a reserve.

The *Wanze G1* was prone to overheating. In such circumstances, it would be temporarily disconnected until it cooled down, and the *Borkum* would be connected to the *Bali* antenna. It was also possible to connect the *Wanze* to the FuMO 30 mattress antenna.

U 505 refit 10X (23/08/43 to 17/09/43) - *Wanze* installed along with the FuMB Ant 3 *Bali* antenna. The *Metox* and *Biscay Cross* were removed during this refit, though the *Biscay Cross* antenna was probably carried inside the boat as a reserve.

FuMB Ant 3 *Bali 1* antenna - The antenna for the FuMB 9 *Wanze* G1 was the FuMB Ant 3 *Bali runddipol* (round dipole). This consisted of a cylinder enclosed in a wire mesh frame, with two dipoles pointing vertically out of the top. Known as the “wire basket” in interrogation reports, the cable went through the stand and entered the pressure hull. The *Bali runddipol* was pressure-tight and overcame the shortcomings of the previous antennae which had to be taken into the boat when diving. The *runddipol* antenna did not allow any direction finding capability.

When boats were fitted with the *schnorchel*, the FuMB Ant 3 *Bali runddipol* antenna was normally fitted on the tower and the top of the *schnorchel*.

U 505 refit 10X (23/08/43 to 17/09/43) - *Wanze* installed along with the FuMB Ant 3 *Bali 1* antenna. The FuMB Ant 3 *Bali 1* antenna remains on U 505 on the port side of the tower, directly ahead of the FuMO 30 box.

FuMB 9 *Wanze* G2 - Following the order on the 5th November 1943 to cease using *Wanze* G1, a newer version (*Wanze* G2) which did not radiate was ordered. This was introduced in late November 1943.

There is no information to confirm that U 505 was upgraded from *Wanze* G1 to *Wanze* G2. But due to the banning of G1 it is almost certain that this did occur. The most likely time period for the changeover would be refit 12X (08/11/43 to 20/12/43).

FuMB 10 *Borkum* - The FuMB 10 *Borkum* was a primitive stop gap measure that was introduced just after *Wanze* G1 was discontinued. The original intention was that *Borkum* was only to be used until the advent of *Wanze* G2. However, the frequency coverage of *Borkum* resulted in it being used in conjunction with *Wanze* G2 and the *Naxos* system. *Wanze* covered the 1.3 to 1.9 metre range, *Borkum* covered the 0.75 to 3.0 metre range, and *Naxos* covered the 8 to 12 metre range (including the all important 9.7cm wavelength of the ASV Mark III radar). Although only intended as a temporary measure, the fact that the *Wanze* / *Naxos* / *Borkum* combination allowed a near complete coverage of the radar spectrum meant that all three were used together on many boats until the end of the war. *Borkum* used the FuMB Ant 3 *Bali 1* antenna or the existing *Radione* receiver and was introduced in November 1943.

U 505 refit 12X (08/11/43 to 20/12/43) – the war diary (KTB) of U 505 for her final patrol makes frequent mention of *Naxos* and *Wanze* but does not mention *Borkum*. However, many other boats, such as U 515 and U 845, used *Naxos*, *Wanze* and *Borkum* as they were found to be an effective combination. It is very likely that U 505 did have the *Borkum*, with refit 12X being a plausible fitting period.

FuMB 7 *Naxos* - An RAF Stirling bomber, fitted with the latest new ASV Mark III radar, was shot down near Rotterdam in February 1943. This radar set was analysed first by the Luftwaffe and later by the Kriegsmarine. This capture of this cutting edge technology was significant as it allowed the German scientists to analyse and copy the magnetron. These evaluations made it possible to design a radar warning receiver - the *Naxos* - which detected the ASV Mark III radar and did not radiate emissions. The *Naxos* prototype was available in June 1943 and was introduced to the fleet in early October 1943. *Naxos* used the FuMB Ant 3 *Bali* antenna.

U 505 refit 11X (01/10/43 to 08/10/43) - *Naxos* installed. This was operated with the FuMB Ant 3 *Bali* antenna and possibly also used with the FuMB Ant 11 *Finger* antenna.

U 505 refit 14X (02/01/44 to 16/03/44) - an improved *Naxos* version with longer range installed.

FuMB Ant 11 Finger - Since direction-finding could not be achieved with the *Bali* antenna, *Naxos* also frequently used the FuMB Ant 11 *Finger* antenna. This consisted of a narrow vertical wooden mast with a circular disc at the top, and a 9cm metal rod extending out of the top of the circular disc. Since this antenna was liable to breakage, especially when moved quickly inside the tower when the boat dived, spare aerials were often carried. The *Finger* antenna was usually mounted temporarily between the periscopes. Among the boats which used this antenna were U 515 and U 845.

U 505 refit 11X (01/10/43 to 08/10/43) - The FuMB Antenna 11 *Finger* antenna was probably issued to the boat at this time. Since it was removable, it was not a permanent feature on the tower.

The conventional dates are provided in the blue text above. In *Steel Boats*, Hans Göbeler states that FuMB 7 *Naxos* was fitted in refit 8X (early August) and that FuMB 9 *Wanze* (version not specified) was fitted in refit 10X. This is at odds with the conventional view, which holds that *Naxos* was introduced in October 1943, a few months after *Wanze* was implemented.

For Göbeler's information to be correct, U 505 would have to have been carrying *Naxos* two months early, in an experimental capacity. If *Naxos* had been carried at this point, it would seem prudent to have fitted *Wanze* (which was available in August 1943) at the same time. This is because *Naxos* only covered part of the high end of the spectrum (8 to 12 metres), while *Wanze* G1 covered the 1.3 to 1.9 metre range.

Radar warning receivers (post-capture)

Additional note: readers are reminded that the modifications in the dark red text were **NOT** made to the boat (they are what *may* have been fitted if the boat had continued in Kriegsmarine service).

FuMB Ant 24 Cuba 1 (Fliege) - In March 1944 an improved antenna was built for the *Naxos*. This was the FuMB Ant 24 *Cuba 1* (also known as *Fliege*, meaning fly). Depending on the predilection of the boat's commander, this could be fitted either inside the direction finding loop or on its own mast between the periscopes. First installed in April 1944, the *Fliege* was another antenna that had to be taken inside the boat when the boat dived.

U 505 - It is possible that U 505 would have been fitted with this set in the refit that would have followed patrol 14.

FuMB 26 Tunis - Following the introduction of shorter wavelength radar systems by the Allies in May 1944, the Germans countered with the FuMB 26 *Tunis*. This was a combination of FuMB 24 *Fliege*, FuMB Ant 24 *Cuba 1*, and FuMB Ant 25 *Müecke*. The *Fliege* was for 8-23 cm wavelength, and had a parabolic-shaped antenna (FuMB Ant 24 *Cuba 1*) which faced aft. *Müecke* was for 2-4 cm wavelength, and had a horn-shaped antenna which faced forward.

Although *Tunis* replaced *Naxos*, both *Wanze* and *Borkum* were retained to provide coverage of low frequencies. This meant that some boats had, at one point in time, *Wanze*, *Borkum*, *Fliege* and *Müecke* internal equipment, plus FuMB Ant 3 *Bali 1*, FuMB Ant 24 *Cuba 1* and FuMB Ant 25 *Müecke* antennae on the tower – quite a combination!

Depending on the preference of the boat's commander, the *Tunis* system was mounted either inside the direction finding loop or on its own mast between the periscopes. Once again, the *Fliege* / *Müecke* combination had to be removed from the tower each time the boat dived.

U 505 - It is very likely that U 505 would have been fitted with *Tunis* (with accompanying *Fliege* and *Müecke* antennae) at some point in 1944.

FuMB 35 Athos - The final refinement came in September 1944 when the FuMB 35 *Athos* was introduced. The antenna for the *Athos* was very distinctive - two capstan-shaped circular arrays mounted on top of a telescopic mast.

U 505 - The *Athos* was very rare (possibly only fitted to U 249) so it would probably not have featured on U 505.

FuMB 37 Leros - The FuMB 35 *Athos* was coupled with a FuMB Ant 3 *Bali* antenna to form the FuMB 37 *Leros* system.

U 505 - This was probably only fitted to Type XXIs so it would not feature on U 505.

Note: For summary table please see Part XII.

Part V - Countermeasures

Anti-sonar decoys

Bold - Code named *Bold* (short for *Kobold*, meaning “deceiving spirit” or “goblin”), this anti-sonar decoy consisted of a large mass of air bubbles which were created beneath the surface. This produced an echo which was intended to fool Asdic operators into thinking that this was a U-boat contact. The mass of air bubbles was created using calcium hydride capsules, which were ejected from a 10cm or 15cm diameter container known as the *Pillenwerfer* (“pill thrower”). This was considered a successful system and was introduced to all operational U-boats in 1942 or early 1943. Upgraded versions, *Bold 4* (introduced in 1944) and *Bold 5*, operated at greater depths.

U 505 - Fitted to U 505 in February 1943 during refit 5X.

Anti-radar decoys

Note: the code FuMT means *Funkmess-Täuschung* (active deception).

FuMT 1 Aphrodite - Code-named *Aphrodite*, this anti-radar decoy consisted of a 36-inch diameter hydrogen-filled balloon which was tethered by a line to a sheet anchor. Once suspended, three aluminium foils of four metre length were attached to the line by a cross-bar. This would act as a radar reflector and create false radar echoes. Initially, the decoys were meant to be inflated on the deck using one of the two hydrogen cylinders on the tower bulwark. Later, pressure-tight containers were introduced under the tower floor to safely house the hydrogen bottles.

First fitted in June of 1943, and deployed operationally in September of 1943, *Aphrodite* was commonly used by U-boats until the introduction of the *schnorchel* made surface transit less frequent.

U 505 - Early in refit 5X, two hydrogen bottles were added (each one was directly behind a tower bulwark) to the upper platform of the Turm II. It is possible these bottles were also used to inflate weather balloons. At a later stage (probably with the introduction of the Turm IV later in refit 5X), these two bottles were removed. Six bottles were introduced under the floor of the lower wintergarten platform. These can be seen in photograph 507 of the Task Group 22.3 Report (Enclosure G) at <http://www.uboatarchive.net/U-505EnclG507.htm>. This webpage includes the caption “Flask as in rack aft of conning tower on U-505”. To ensure there is no confusion as to their location, the bottles were under the floor of the lower wintergarten platform, directly behind the upper platform.

FuMT 2 Thesis II C - *Thesis* included a variety of floating decoys that were intended to confuse Allied radar operators. It consisted of thin metal dipoles added to the top of a five metre long wooden pole. At the top of the decoy buoy was a thin wire filled with foil bands. This equipment took up a lot of space under the deck casing and proved awkward to assemble on a rolling deck.

First introduced in January 1944, *Thesis* continued to at least April 1944. It was discontinued around this time when it was recognised that Allied radar sets were not picking up the decoys. Boats which carried *Thesis* in early 1944 included U 66, U 91 and U 744. A later version, FuMT 4 *Thesis US*, was launched underwater through the *Bold* ejector but it was not used operationally.

U 505 - If U 505 did carry this decoy system, it was probably fitted in refit 14X.

Anti-radar coatings

Tarnmatte - A sound absorbing coating was also added to a number of *schnorchel* heads. Known as *Tarnmatte*, it can be distinguished by a criss-cross shape on the top surface.

U 505 - Not fitted to U 505.

Anti-sonar coatings

Radar absorption - A radar wave absorbing mat (*Bachen-Netz*) was fitted to the conning tower of U 968 in the autumn of 1943. A few months later, in late 1943, a different type of absorbing material (*Schornsteinfeger*) was used on U 390. Soon afterwards the tower of U 708 was coated with black paint which included radar absorbing properties. Later, U 1277 had parabolic metal screens added.

U 505 - Not fitted to U 505.

Alberich - To counter Asdic, a few boats were fitted with sound absorbing anechoic tiles. Known as *Alberich*, this reduced the sonar reflection of the boat.

U 505 - Not fitted to U 505.

Part VI - Damage During Capture

Several warships and aircraft fired countless rounds, of various calibres, at U 505 during the capture. The following are some of the more obvious signs of damage sustained at this time -

Bow plane - The port bow plane of U 505 was ripped off during the second of two collisions with the USS *Pillsbury*.

As a point of interest, the two collisions resulted in considerable damage to the hull of the escort. The first collision made two holes, both of 2 1/2" x 4". The second collision made another two holes, of 5-6" x 19" and 21" x 4-5". Following the second collision, a large section of U 505's bow plane was wedged inside the escort's hull and three compartments were flooded below the waterline.

Rudder - The rudder was jammed to the starboard side.

Ballast tank - A 20mm shell punctured number 7 ballast tank.

Holes in deck - Although there is no available photographic evidence, it is likely that some rounds would have hit the wooden deck.

Torpedo storage tube - The torpedo storage tube on the port side, just to the side of the lower wintergarten platform, was damaged, as was the warhead of the torpedo itself. The torpedo, storage tube and metal cover, were all rolled overboard by American personnel.

Deck railings - Some of the deck railings on the starboard side were bent. On the port side, the top rail was bent slightly in one position, and one of the vertical stanchions (beside the torpedo tube cover) was severed. On both sides, three vertical stanchions at the front of the group appear to have

been missing after the capture. To depict U 505 during or after capture, the railings on a model would have to be altered accordingly.

Holes in tower - The tower of U 505 was punctured by cannon and machine gun fire in several places. Thankfully successive curators have chosen not to repair these holes so that visitors to MSI are presented with first hand evidence of the damage sustained by the boat. On the starboard side, there appears to be ten jagged holes of various sizes on the tower, four holes on the wintergarten platform, and three holes on the magnetic compass fairing. On the port side, there are a few small holes near the emblem, and two holes on the port side of the wintergarten platform.

Wind deflector flange - The most obvious sign of damage concerns the wind deflector flange at the top of the tower. As can be seen in the available images, a section of the flange is clearly missing and damage to the forward jumping wire is also evident. The wire would normally be attached to both sides of the tower but it can be seen that the wire had detached from the attachment point on the starboard side. The insulators for the starboard side can be seen hanging downwards at the right hand side. The forward jumping wire itself was not taut and hanged limply on the foredeck.

There are photos showing other Type IXs with sections of the wind deflector flange missing; these include U 106, U 126, U 506, U 530, U 550, U 870, U 889 and U 1227. The thin steel deflector may have been susceptible to being ripped off the tower as the result of depth charge attack.

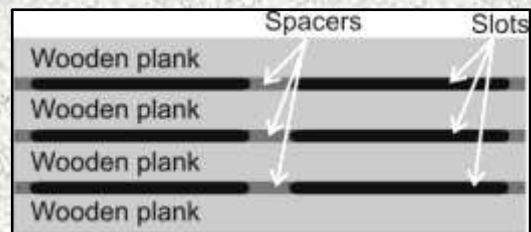
37mm automatic - The 37mm automatic on the lower wintergarten platform (3.7cm M 42U gun on LM 42 U mounting) was knocked out of place following the depth charges attacks.

Part VII – Future Kriegsmarine Modifications

In this section we will examine the modifications which may have been made if U 505 had not been captured.

Although not directly relevant to the modeller of U 505, it is hoped this information may assist modellers who intend to build a different late-war IXC boat.

Note: To be clear, the following modifications were **NOT** made to U 505 (they are simply what *may* have been fitted to U 505 if the boat had continued in Kriegsmarine service until the end of hostilities).



Above (5): As can be seen in the drawing above, the *slotted* style of decking was achieved by adding wooden spacers and slots in between the wooden planks. The various dimensions, such as plank width, spacer length and slot width, were the same on Type Is, IIs, VIIs, IXs and XIVs. With the exception of Type XXIs and XXIIIs, which did not feature wooden decking, the slotted decks produced a style that was distinctive to all Kriegsmarine U-boats.

Deck - There were two types of wooden deck used upon U-boats – the earlier *slotted* style and the later, more simplified *planked* style. The first U-boats to be built with the planked deck were launched as early as the autumn of 1942. However, as there were variations between shipyards, in some yards the introduction of the planked decks may have taken place a little after the autumn of 1942. Boats launched in 1943, such as U 534, had the planked style.

While other modifications would be retrofitted to existing boats, the installation of the planked deck only took place on newly-built boats. Changing existing decks to the planked arrangement was nowhere near worthwhile for the financial and manpower expenditure. Therefore, boats which were launched with the slotted deck would keep their slotted deck until their demise.

U 505, which was built with the slotted style, would therefore **not** have received the planked deck.

Cut out foredeck - The large size of the Type IXs had implications upon their ability to dive quickly. When the need to evade approaching aircraft became more desperate, an attempt was made to reduce the diving time of Type IXs by cutting out a large section on either side of the foredeck. This alteration produced a very identifiable visual change but did not gain an appreciable improvement in diving time.

On pages 33 and 34 of *Vom Original zum Modell: Uboottyp IXC* by Fritz Köhl and Axel Niestle, the authors list the IXCs and IXC/40s which received the cut out foredeck and the dates when the alteration was completed. Note that this feature was not universal by the end of the war - U 532, U 534 and U 889 are some examples of IXs which did not receive this modification. Therefore, U 505 may or may not have had the cut out foredeck if the boat had remained in active service until the end of the war.

Some enthusiasts believe in two fallacies - firstly, that the cut out foredeck was an exclusive feature of the IXC/40; and secondly, that this feature was added to all IXC/40s. Although quite understandable, both these assumptions are erroneous. Many Type IXC/40s were built before the introduction of this cut out foredeck and were therefore launched with the normal deck. It is also true that the cut out foredeck was added to IXs regardless of variant or sub-variant.

As a side note, U 805 was fitted with a curving walkway on the foredeck. This started off on the port side of the tower, then turned at a 45-degree angle, and then turned again to run centrally along the foredeck up to the point where the cut out foredeck began.

Late-war tripod jumping wire supports - Following the introduction of lower wintergarten platforms, Type IXs were fitted with tripod supports on the aft deck to raise the level of the jumping wires. Normally IXs would have these supports in the positions we see on the Revell kit.

On some later boats, such as U 532 and U 805, a late-war tripod style was introduced; these faced outboard and were located farther forward along the aft deck, directly inboard of the planked sections at the edge of the deck. In this arrangement, the insulators were positioned directly in front of the tripod supports. A number of late-war VIICs and VIIC/41s also had the late-war tripod style. Due to time frame considerations we may ask if the late-war tripod style was exclusive to planked decks. This theory is disproved by photos of U 377 and U 415, which featured slotted decks and the late-war tripod style.

Schnorchel - The *schnorchel* system included a hinged mast on the deck, a clamp on the tower to hold the mast upright, and air trunking on the starboard side of the tower. On Type IXs the *schnorchel* was fitted to the starboard side, whereas on Type VIICs the device featured on the port side. On page 30 of *Vom Original zum Modell: Uboottyp IXC* by Fritz Köhl and Axel Niestle, the authors list the IXCs and IXC/40s which received the *schnorchel*, the type of device, and the dates in which the device was fitted. Although implementation began on operation boats in November 1943, very few boats had this feature by April 1944.

U 505 would almost certainly have been fitted with this feature, perhaps directly following patrol 14. The air trunking for the *schnorchel* would normally have been fitted to the starboard side of the tower, where it would have displaced the ready container tube for the replacement 37mm barrel.

Torpedo storage tubes - Type IXs were fitted with eight pressurised storage tubes for spare torpedoes. The process of transferring the spare torpedoes from the storage tubes into the boat was time consuming. Late in the war, when the threat of air attack made this lengthy procedure much too hazardous, the storage tubes were removed. They were removed from U 68 in early 1944, whereas removal from U 805 took place in late 1944 or early 1945. Although U 505 retained them at the time of capture, it is likely that they would have been removed in the months which followed.

[Askania magnetic compass fairing](#) - The magnetic compass on U 505 was located inside a fairing at the front end of the tower. On page 9 of *U-Boot Im Focus* Edition 2, it is stated that a new type of compass – the “Askania” type - was ordered for new boats on the 15th October 1942. Shaped like an inverted cone, the new housing was entirely separate from the tower and was located just ahead of the old location. Although U 534 appears to have had the *Askania* magnetic compass in 1943 (possibly in an experimental capacity), implementation on most boats occurred around the latter half of 1944. When boats were retrofitted, a metal plate was positioned underneath the area vacated by the previous magnetic compass fairing. Most Type IXs were fitted with the *Askania* magnetic compass by the end of the war so it is likely that U 505 would also have been converted at some point. However, a photo of U 190 showing the normal fairing at the end of the war means that the fitting of the *Askania* type would not have been guaranteed

[Radar and radar warning receivers](#) - This is covered in Part IV (see dark red text). Additionally, the pole with the *Bali* antenna would have been moved from the port side to a central location between the two periscopes.

[UZO - Uberwasserzieloptik \(torpedo aimer\)](#) - Late in the war, the existing UZO column was replaced with a new type. Note that the UZO column was offset to port on Type IXs.

[Twin 37mm](#) - By the end of the war, U 534 and U 190 both featured a twin 37mm automatic on the lower wintergarten platform. According to Jon Kelly, U 534 had a 3.7cm Zwillling M 42 U gun on a DLM 42 U mount, which was upgraded to a 3.7cm Zwillling M 43 U gun on a DLM 42 U mount. Although rare, it might have been possible for U 505 to have been fitted with this very powerful armament.

[Zwiebel](#) - The *Zwiebel* system at the bow included hydrophones enclosed within a rounded housing at the forward end of the upper deck. U 889 is reputed to be the only U-boat fitted with this system so it is unlikely that U 505 would have received it.

Part VIII - Post-capture Modifications

The fascinating story of how U 505 migrated all the way from the Atlantic Ocean to Chicago can be found in the chapter *Project 356: U-505 And The Journey To Chicago* within *Hunt And Kill*. This authoritative chapter was penned by Keith Gill, the former curator of the U 505 at MSI who was (and is) highly regarded by enthusiasts for his contributions to the boat and to U-boat research in general. Many of the brief details which are included in the following timeline were derived from Keith's excellent chapter.

A few of the dates in the immediate post-war period were derived from naval historian Derek Waller's excellent online article *U-505 In The US Navy* (<http://candotg.org/USNavy.htm>). This is highly recommended reading for those interested in the story of the boat's move to Chicago.

Due to the constant process of deterioration and restoration, some of the boat's current features differ from the original wartime features. The chronological breakdown which follows shows the general order in which these modifications were made. In order for readers to extract information more easily, each feature is also covered individually at the end of this section.

Bermuda modifications

Following the boat's arrival at Port Royal Bay in Bermuda on the 19th June 1944, it was evaluated by the US Navy's Office Of Naval Intelligence. In the quest to assess the quality of the many individual components which made up a Type IXC U-boat, technical equipment was either tested

on site or removed for further study. This resulted in an array of systems being removed from the boat. The radio and sound rooms, for example, were stripped bare.

In dry-dock in Bermuda, the following modifications and repairs were completed -

- Forward dive plane on the port side replaced.
- Rudders freed.
- Hole to number 7 ballast tank repaired.
- At some point (perhaps in Bermuda) rectangular plates were added over the *Unterwasser Telegraphie* (UT, underwater telegraph) membranes, which were located above the forward dive planes. These membranes were probably removed for evaluation by the US Navy.
- Torpedo storage tube cover on port side replaced with wooden planking (the original metal cover had been jettisoned along with the damaged torpedo and the torpedo storage tube).
- Deck railings repaired (though not to original design).
- Forward jumping wire repaired, but without any insulator blocks directly in front of the tower. The original jumping wires aft of the tower may also have been replaced.
- Tall pole added to the foredeck, near to the bow. The forward jumping wire was attached to the top of this pole.
- Tall T-bar added to the aft deck, just ahead of the rearward facing navigation light.
- Wind deflector flange repaired.
- Running light added to front of tower, near the top of the bulwark.
- Some form of vertical tubular attachment added to the outside of a vertical stanchion on the upper platform railings (on both port and starboard sides).
- Anti-aircraft guns probably removed for evaluation.

The holes in the conning tower were not repaired. U 505 was then returned to sea with a US crew and used to train destroyer crews. In an effort to keep the capture a secret, the boat was named USS *Nemo*.

Post-capture timeline

- 16th May 1945 - US Navy Press Release made a public announcement about capture and salvage of U 505.
- 18th May 1945 - US Treasury Department announced that U 505 would undertake two war bond tours to raise funds for the war against Japan. It was intended that U 505 would visit more than 20 ports and cities in these two tours.
- 18th May 1945 - U 505 departed from Bermuda.
- 23rd May 1945 - Arrived in Philadelphia for the start of the first tour with US Navy crew on board. Spectators could climb on board if they purchased a war bond.
- 7th July 1945 - First tour ended.
- 1st August 1945 - Second tour began.
- 8th January 1946 - Memo stated that second war bond had finished, and that spare parts could be taken from U 505 for other remaining U-boats.
- 12th January 1946 - Arrived at Boston naval base after the end of the second tour.
- 1946 - The US Navy had decommissioned the boat, had extracted all technical information, was using U 505 for spares for other U-boats, and was intent on using the boat for gunnery and torpedo practice until it sank.
- 3rd May 1946 - Transferred from Boston to Portsmouth, New Hampshire.
- 13th January 1947 - Captain Daniel Gallery started efforts to save the boat and bring it to Chicago.
- September 25th 1947 - Lunch between Father John Gallery (brother of Captain Daniel Gallery) and Lenox Lohr of MSI. This started a series of complex negotiations (particularly over

who should foot the transportation costs) over several years which would eventually see the boat moved to the museum.

- October 6th 1947 - With U 505 due for disposal in November 1947, museum representatives sent a telegram to the Secretary of the Navy and Chief of Naval Operations Admiral Chester Nimitz. The boat would subsequently be saved from destruction.
- Late 1949 - U 505 was again on list of boats to be used for gunnery practice or scrapped.
- 22nd April 1953 - U 505 was the only remaining U-boat at Portsmouth. A *Chicago American* article discussed the advanced state of decay, mentioning parts being stripped and cannibalised, heavy rust, and periscopes missing. With eight years spent exposed to sea air, the outer hull was deeply pitted with rust. Questions were raised as to whether the boat was in a suitable condition to withstand a several thousand mile voyage to Chicago.
- 12th August 1953 - Moved into dry-dock at Portsmouth. Barnacles and sealife removed from lower hull. Diving planes removed. Every exterior opening sealed. At rear of torpedo doors, locks added over the doors. Deep exterior scars present, including a large hole at the stern on the port side. Running lights added on either side of the tower. Original anchor removed and auxiliary anchor fitted.
- Early September 1953 - Repairs completed.
- 9th March 1954 - Boat transferred from US Navy to the Museum of Science and Industry.
- May 1954 - In addition to the small welded Kriegsmarine examples, large welded waterline draught marks were added to the boat in preparation for the towed journey to Chicago.
- 15th May 1954 - U 505 left Portsmouth, New Hampshire. It would travel through 28 locks on the St. Lawrence, and through four of the five Great Lakes, on its way to MSI.
- 3rd June 1954 - Arrived in Cleveland. Upper hull and tower repainted.
- 7th June 1954 - Departed Cleveland.
- 26th June 1954 - Arrived in Chicago.
- 28th June 1954 - Towed to *American Shipbuilding* dry-dock. Preparations for move.
- 2nd July 1954 - Towed to another *American Shipbuilding* dry-dock in Calumet river. Structural work undertaken.
- Early July 1954 - Moved onto the *Great Lakes Dredge And Dock Company* floating dry-dock. Photos at this time can be seen at <http://www.neiu.edu/~reseller/esu505albm.htm>.
- 13th August 1954 - Made transit to 57th Street Beach aboard floating dry-dock. After moving off floating dry-dock, the boat spent two and a half weeks on the beach with the bow jutting out over the water.
- 2nd September 1954 - Lake Shore Drive closed. The move across this main road (on a rail and roller system) began.
- Early September 1954 - Arrived at MSI.
- 19th September 1954 - Repairs and repainting in preparation for dedication ceremony.
- 25th September 1954 - Dedication ceremony at MSI.

September 1954 restorations

Between the 19th and the 25th September 1954, the following repairs were hastily conducted to make the boat presentable for the dedication ceremony -

- Diving planes replaced.
- Locks over torpedo doors removed.
- Holes on hull patched up.
- Exterior sandblasted and new light grey / black paint scheme applied.
- Deck railings repaired (not to original design).
- Jumping wires added.

- Running lights on either side of the tower removed (the central running light at the front of the tower retained).

At this time neither of the original periscopes were available. A British navigational periscope was fitted, as was a mock-up of the sky periscope. The original anchor was not replaced on the boat.

Subsequent restorations

Restoration projects were conducted in 1954, 1968, 1978 and 1988 / 1989. The following changes occurred -

- On each restoration (1954, 1968, 1978 and 1988 / 1989), sandblasting of the hull progressively reduced the thickness of the outer skin.
- During the course of restorations, some of the free-flooding vent holes were not replaced according to the boat's original wartime patterns. This included the four vents at the stern (above the rear dive planes) which were filled in at some point. More details can be found in Part IX.
- At some point the rear section of the propeller shaft housing (on both port and starboard sides) was removed and not replaced.
- A protective bar was fitted from the forward dive planes to the hull.
- At some point in the 1950s, the rotted areas of the deck were replaced. The anti-slip strips around the 105mm deck gun position were removed. Note that the slotted deck style remained on the boat for decades.
- Originally the boat had a metal cover for torpedo spare tubes on either side of the tower. The boat now had only wooden planking in these areas on either side of the tower.
- In the 1970s, only one insulator block was present in front of the splitter on the forward jumping wire. The forward jumping wire did not meet with the foredeck, rather it met with a tall vertical stanchion in place on the bow.
- In the 1970s, the capstan had several poles jutting out at different angles.
- At some point a square-shaped area was added directly on top of the magnetic compass fairing.
- The original sky periscope was returned in 2002.
- Some original sound and radio equipment was returned.

Final restoration project

In 2005, following a \$23.5 million restoration project, U 505 opened to the public in a new climate controlled underground enclosure. The restoration project completed the following -

- Large welded waterline draught marks removed.
- Protective bar between the forward dive planes and hull removed (this was actually completed after the move).
- Deck replaced with planked deck.
- Tall vertical stanchion on the foredeck, near to the bow, removed.
- Tall T-bar on the aft deck removed.
- Insulators added in correct positions to both the forward jumping wire and both aft jumping wires. The forward jumping wire now met with the foredeck in the correct position.
- Wind deflector flange section removed to correctly show the boat during capture.
- Square-shaped area on top of the magnetic compass fairing removed, leaving a square hole on the top surface of the fairing.
- Running light on front of tower removed.
- Vertical tubular attachments on either side of the upper platform railings removed.

The inaccuracies in the deck railings were not corrected so the boat retained a railing pattern which differed from the original design.

Individual features

The information above has been presented in chronological order. In order to make it easier to extract information, the information has been broken down into individual features.

Hull plating - In 1954, deep exterior scars, including a large hole at the stern on the port side, were present. A section midway along the hull, just below the main drainage holes, was particularly badly deteriorated. Sandblasting took place during restorations in 1954, 1968, 1978 and 1988 / 1989; this reduced the thickness of the outer skin on each occasion.

Free-flooding vent patterns - As a consequence of the replacement of hull plating, some of the free-flooding vent holes were not replaced according to the original wartime pattern. This included the four vents at the stern (above the rear dive planes) which were filled in on U 505 at some point. More details can be found in the Part IX.

Kriegsmarine welded waterline draught numbers - As discussed in Part IX, some of the welded waterline draught numbers are missing from the boat. By 1954 the section midway along the hull, just below the main drainage holes, was particularly badly deteriorated. When hull plating was added to restore this central area, new welded draught numbers were not added.

Prior to the move to Chicago, locks were added to the rear of the torpedo doors directly over some of the welded waterline draught numbers on the bow. This accounts for why the lower figures are missing from this area of the boat.

Large US-style welded waterline draught numbers - In addition to the small welded Kriegsmarine examples, large welded waterline draught marks were added to the boat in preparation for the transit to Chicago. On the port side there were six numbers – 0, 1, 2, 3, 4, 5 – running vertically from bottom to top. The starboard side had the same six numerals, but due to the position of the anchor, the numerals 4 and 5 were positioned forward of the anchor recess. These numbers were all removed in 2003 / 2004.

Anchor - In August 1953, the original anchor was removed and an auxiliary anchor fitted. The original anchor was not relocated on the boat and resides in MSI as a separate display feature.

Propeller shaft housing - At some point in Chicago, the rear section of the propeller shaft housing was removed and not replaced.

Unterwasser Telegraphie - At some point, perhaps in Bermuda, rectangular plates were added over the *Unterwasser Telegraphie* (UT, underwater telegraph) membranes, which were positioned on the hull just above the forward dive planes. These membranes may have been removed for evaluation by the US Navy.

Deck - At some point in the 1950s, the rotted areas of the deck were replaced. The anti-slip strips around the 105mm deck gun position were removed at this time.

In 2003/ 2004, the opportunity was taken to replace the slotted wooden deck. Unfortunately the replacement deck was of the planked variety, which had never featured on the boat.

Deck railings - The deck railings were repaired in Bermuda but probably not to wartime specifications. In July 1954, the deck railings were again in poor condition, with bent and missing stanchions. In September 1954, prior to the dedication ceremony, the deck railings were repaired. In 2003 / 2004, the inaccuracies in the deck railings were not corrected, leaving U 505 with a railing pattern which differs from the original design.

Cover on deck for torpedo storage tube - In Bermuda, the torpedo storage tube cover on the port side was replaced with wooden planking (the cover had been jettisoned along with the damaged torpedo and the torpedo storage tube).

Jumping wires and insulators - In Bermuda, the forward jumping wire was repaired but there were no longer any insulator blocks in front of the tower. The forward wire met with the top of a tall pole fitted to the foredeck. The original jumping wires aft of the tower may also have been replaced. The jumping wires were removed for the journey to Chicago and replaced by the time the boat went on public display. In the 1970s, only one insulator block was present in front of the splitter on the forward jumping wire. In 2003 / 2004, the insulators were added in the correct positions to both the forward jumping wire and both aft jumping wires.

Wind deflector flange - The wind deflector flange was repaired in Bermuda. In the final restoration in 2003 and 2004, the section of the wind deflector flange section which had been added in Bermuda was now removed. This was quite an important modification because it allowed the boat to regain the appearance it had during capture.

Magnetic compass fairing - At some point in Chicago a square-shaped area was added directly on top of the magnetic compass fairing. By 2005 this area had been removed, with only a square hole being present on the top surface of the fairing.

Running lights - In Bermuda, a central running light was added to front of tower, near the top of the bulwark. Prior to the journey to Chicago, a running light was added to either side of the tower (the port light was fitted to the outside surface of the FuMO 30 box). In September 1954, the running lights on either side of the tower were removed but the central running light was retained. In 2003 / 2004, this central light was removed.

Attachments on upper platform railings - In Bermuda, some form of vertical tubular attachment was added to the outside of a vertical stanchion on the upper platform railings (one on each side). In the 2003 / 2004 restoration, these were removed.

Damage to tower - The holes in the conning tower were not repaired.

Periscopes - By the time the boat went on public display in 1954, neither of the original periscopes were present. A British navigational periscope and a mock-up of the sky periscope featured on the boat. The original sky periscope was returned in 2002. The low ceiling currently prohibits this from being displayed in an extended position on the tower so it is now mounted horizontally beside the boat.

Anti-aircraft guns - The 37mm automatic was knocked slightly off position and this damage would have been repaired in Bermuda. Some photos in 1945 show the boat without anti-aircraft guns, while others in this year show the guns in place. They may have been removed for evaluation and then refitted to the boat. It is stated that the original guns (with the exception of one 20mm barrel, which came from U 858) were returned to the boat at some point.

Part IX - Current Features Versus Revell Kit

In the last section we studied how the external features of U 505 changed in the 60 years spent outside exposed to the elements, and how the boat was repaired and restored with varying degrees of accuracy when compared with the wartime prototype. These modifications should give us some understanding as to why certain current features differ from the original design.

If modellers wish to depict U 505 following the capture, they will of course have to modify their model to account for the damage sustained by various attacks from US aircraft and surface vessels. Such modifications are within the capabilities of most modellers (at least I hope so, since I plan to try adding battle damage to my own model). What is much more challenging is attempting to depict U 505 with her current features. As we shall see, a number of alterations would be necessary. The most challenging task, of replacing the slotted kit deck with an entirely new scratchbuilt planked-style deck, may deter all but the dedicated of us from depicting the boat in its present guise.

Hull plating

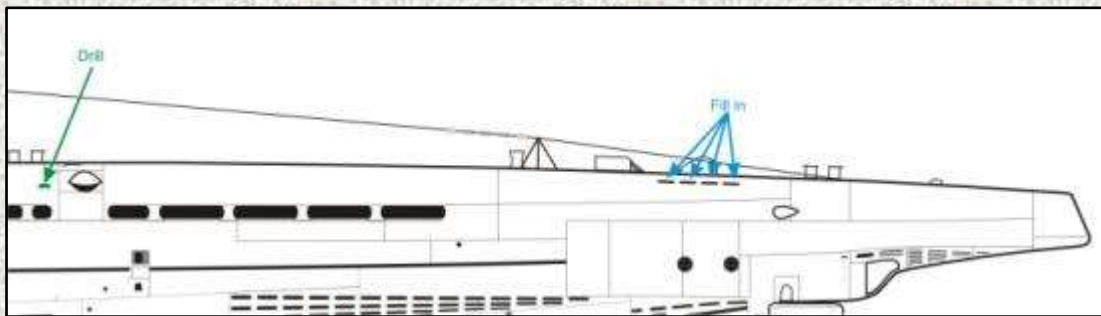
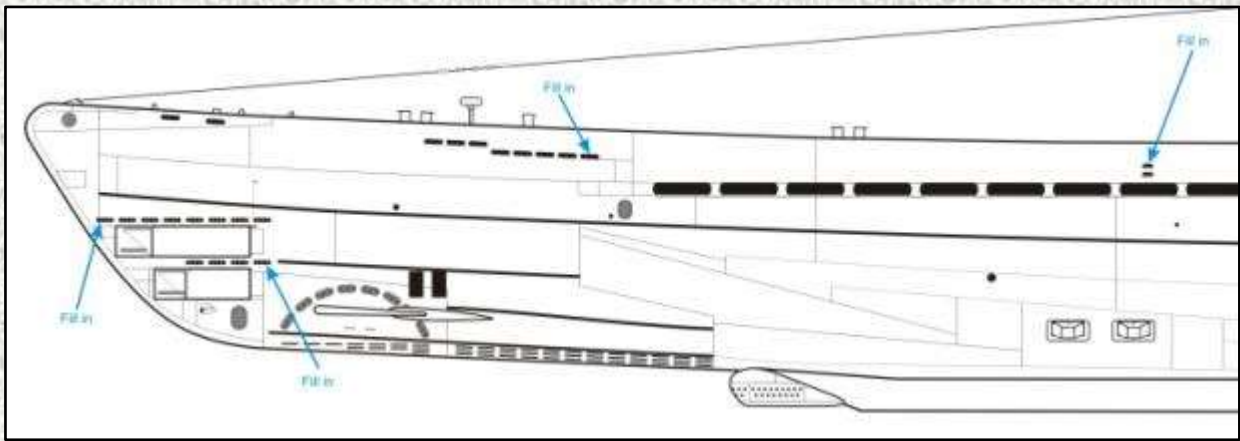
When we view photos of U 505, housed within a climate controlled underground enclosure which protects the boat from the elements, there are, at least on first inspection, no obvious visual clues to betray the fact that U 505 was once a derelict hulk, lying with gaping wounds in her hull and stripped of all her precious technological features. The extensive corrosion damage was the inevitable result of ten full years lying exposed to the salty waters of the Caribbean and Atlantic coast. While the move to MSI saved the boat and ensured her survival from destruction, the seasonal variations that Chicago offers became a threat to the boat. The freezing cold and snow of winter, the rains in spring, the heat and humidity of summer, and the thunderstorms of the autumn, were all endured 50 times over by the wartime relic. In each of the four major restoration projects, when the entire hull was sandblasted, some areas of steel plating were cut away and other plates added. Following the progressive deterioration of the hull, which had “thinned dramatically” since her first days as an exhibit, it was decided that housing the exhibit indoors was essential for its survivability.

Free-flooding vent patterns

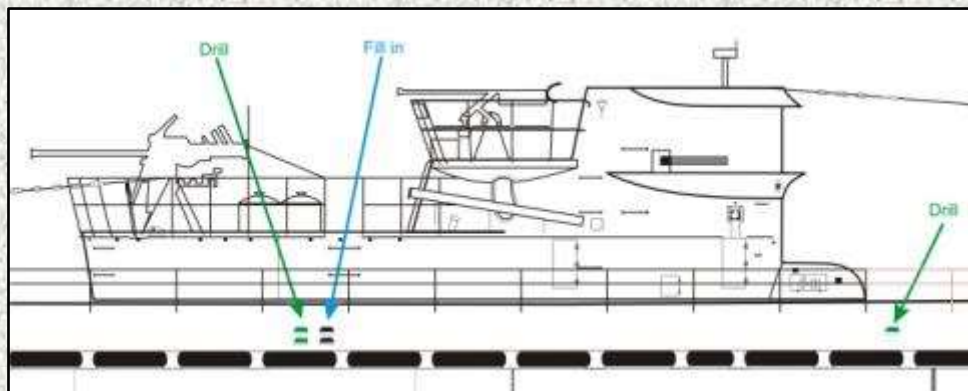
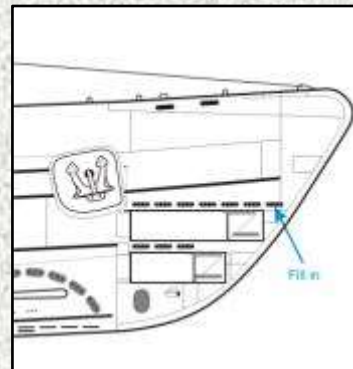
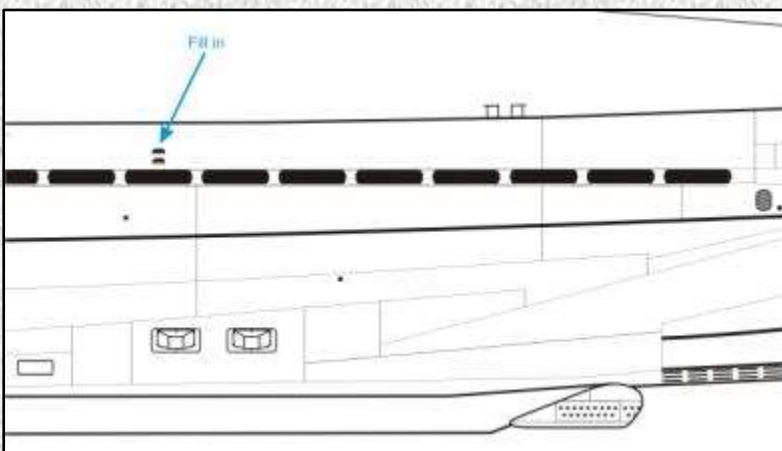
Although visitors cannot see the thin hull plating, evidence of the deterioration can be discerned in the boat’s free-flooding vent patterns. In the process of restoration work, care was not always taken to maintain her original wartime patterns.

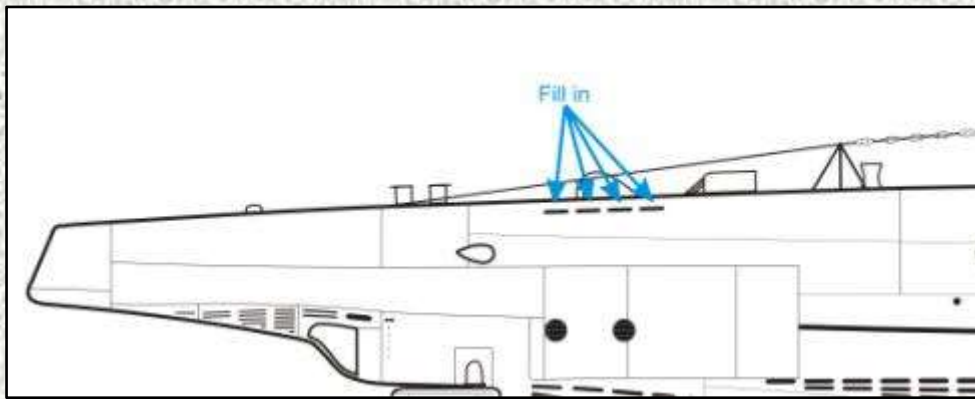
The following drawings illustrate the holes that need to be filled or drilled on the Revell kit in order to depict a modern-day U 505. These changes should **NOT** be completed for any other boat, or indeed for depicting U 505 in her wartime guise. In the drawings, blue indicates holes to be filled in, and green indicates holes to be drilled.

Port side - On the right hand side of the drawing below, a blue arrow points to two steps arranged vertically. Although there is only one arrow, both steps should be filled in.



Starboard side - The two steps on the drawing below (pointed to by the single blue arrow) should both be filled in.

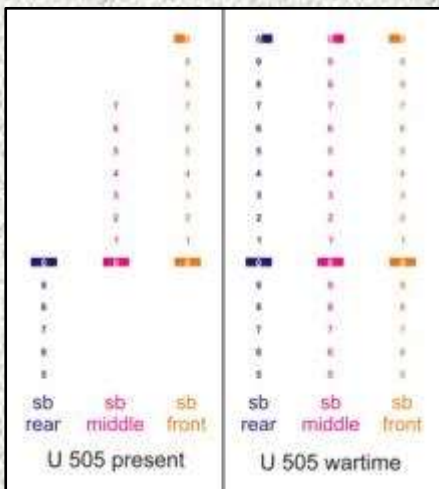




Revell pattern - Since current photos do not immediately betray the depths of restoration works required over the years, it is far from obvious that the vent patterns are presently different from wartime patterns. With this in mind, and the convenience and expediency that the museum boat offers researchers, it would have been easy for Revell to have copied the patterns of the current boat without checking them against wartime photos. Perhaps the known inconsistencies which marred their VIIC kit made Revell extra careful when researching the IX patterns. However, it is rather impressive that Revell chose the correct wartime patterns when they could so easily have been led astray by the modern day U 505.

The Revell kit depicts the vent patterns found on U 505 during wartime so no alterations are required for this boat or others with the same pattern (U 68, U 125-131, U 153-158 and U 503-512). Some alterations are necessary for other Type IXs.

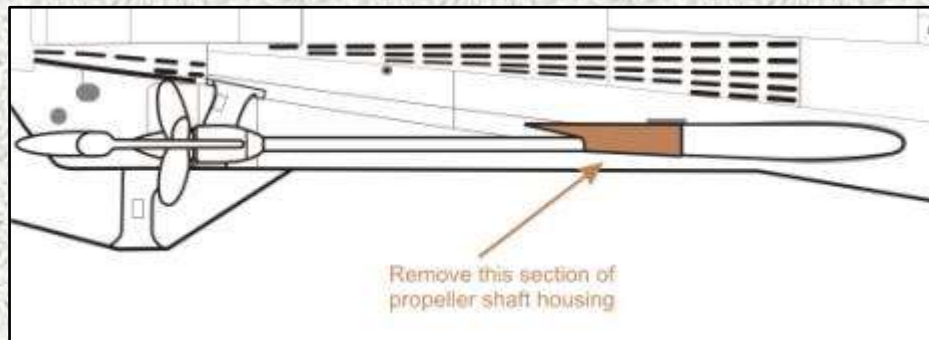
Welded waterline draught numbers



As can be seen from the drawing to the left (which shows the welded waterline numbers on the starboard side) certain numbers were not replaced when repairs were made to the hull. The port side currently has the following numerals –

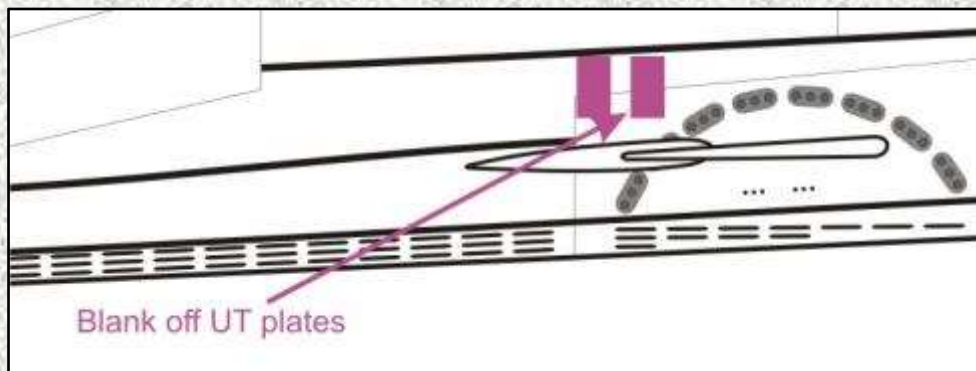
- Rear - Same as starboard side, with middle 0 down to 5.
- Middle - Same as starboard side, except the top 7 is difficult to discern.
- Front - Same as starboard side, except the lower rectangle and 0 are both missing.

Propeller shaft housing



This housing should be removed from both sides.

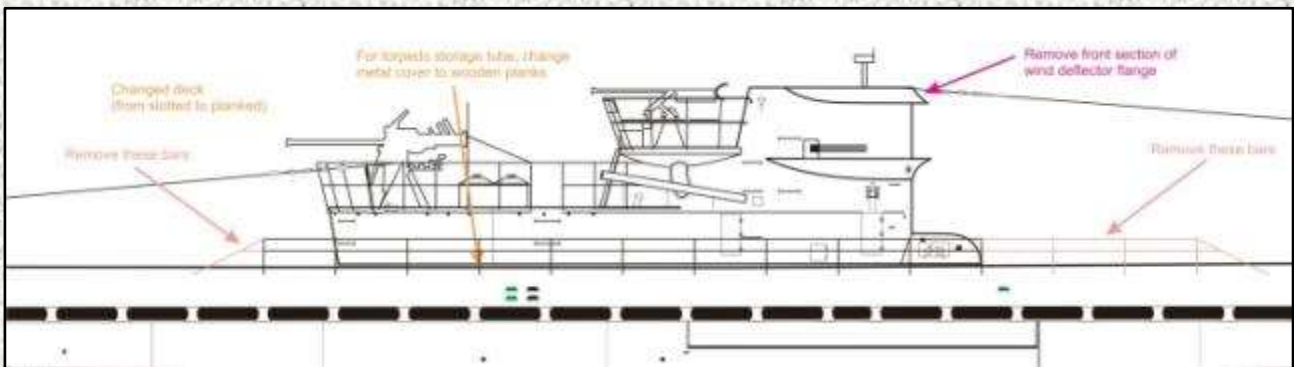
UT plates



The rectangular plates should be added over the UT plates on both sides.

Deck railings

During the final restoration project, the deck railings were not returned to the original design. At the front, the boat currently has three vertical stanchions and one diagonal stanchion missing. At the rear, the diagonal stanchion is missing. The pink lines below show what needs to be removed from the Revell railings.



Other features

Deck - At some point in the 1950s, the rotted areas of the wooden deck were replaced and the anti-slip strips around the 105mm deck gun position removed. The slotted style was retained at this time and this deck remained on the boat for decades.

In 2003/ 2004, the wooden deck was replaced with a planked deck. It is this change from slotted to planked deck which makes the current U 505 a challenging proposition for the modeller.

Cover on deck for torpedo storage tube - On either side of the deck, just beside the lower wintergarten platform, the Revell kit has a metal cover for the torpedo storage tubes. Since U 505 currently has wooden planking in this area, modellers should fit wooden planks.

Wind deflector flange - In order to backdate the boat to the time of capture, the repair to the wind deflector flange was removed during the final restoration in 2003 and 2004. Modellers should also conduct this simple alteration.

Damage to tower - The holes in the conning tower were not patched up so modellers should add this battle damage.

As a direct result of all these differences between the present boat and wartime boats, researchers and modellers should be **VERY** careful when using U 505 (or indeed another museum boat, U 995) as a research tool.

Part X - Insignia & Paint Colours

In this section covering paint colours, it is assumed that readers will already be familiar with Kriegsmarine paint colours. A discussion of this topic may be found in the downloadable AMP pdf *The Wolf Pack: A Collection Of U-Boat Modelling Articles*. As always, the information presented herein merely represents the knowledge of the author at the time of writing. It is hoped that new information will be unearthed to clarify this debatable topic.

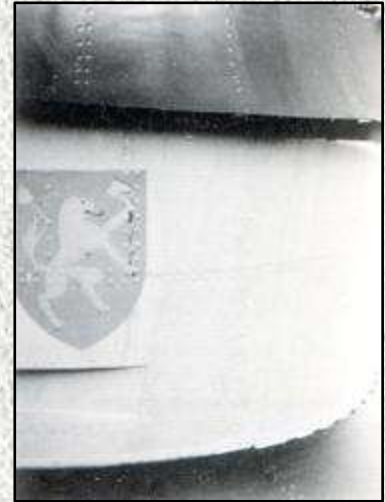
Alex-Olaf Löwe - lion

Light grey - If we look back at photo 1, which shows U 505 being commissioned, and photo 6 on this page, we can see that the boat originally had light grey paint on the tower and upper hull. The shade in these photos displays the washed out characteristics that is typical in many photos showing *Hellgrau 50*, the lighter of the greys that were often used in the early war years. The lower hull would, according to normal practice, have been painted in the standard dark grey anti-fouling paint *Schiffsbodenfarbe III Grau* prescribed in the painting regulations.

As per the painting regulations directive that horizontal surfaces were to be painted black, the top surface of the spray deflector (see photo 6) was painted black. We can also see that the wind deflector was painted black at this time. Since the sloping surfaces of this flange were mostly vertical, it was more usual for the wind deflector to be considered as a vertical surface and be painted grey. However, as we can see from this photo, in some circumstances the flange was painted black. Later the flange would be painted in the same grey paint as was used on the tower.

Lion emblem - In photo 6 we can also see the emblem of the boat's first commander, Alex-Olaf Löwe, directly above the channel for the starboard navigation light. The emblem combines two elements. Firstly, the lion quite obviously relates to Löwe's surname, which means lion in German. Secondly, the axe relates to the emblem of Crew 28, the officer class of 1928 which Löwe graduated from.

The definitive study of U-boat emblems - *U-Boat Emblems Of World War II 1939-1945* by Georg Högel - suggests a white / silver



Above (6): Löwe's emblem on the starboard side of the tower shows a lion wielding an axe. The channel directly below the emblem is the channel to allow light to shine forward from the starboard navigation light. This photo should make for accurate positioning of a decal on an early U 505 model. A similar emblem (the mirror image) would be found in the same position on the port side.

Below (7): Taken by Wink Gris  at MSI, this plaque commemorates a 1980 reunion. The lion is yellow or gold on this plaque, with a blue background. The scallop shell which later adorned the boat has a green background. The axe has been cleverly positioned inside the rune belonging to the flotilla emblem.



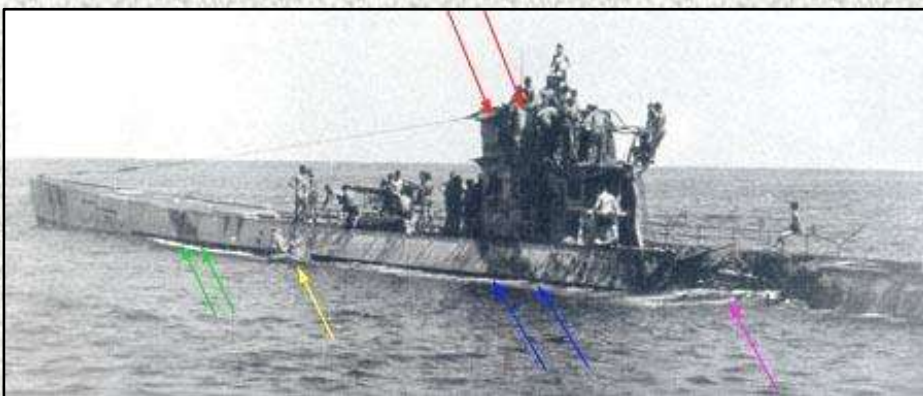
lion and a red background. On a commemorative plaque currently on display in MSI, the lion is yellow or gold and the background is blue. Also of note is that the lion faces to the left on the plaque and faces to the right in photo 6. From this information, it is presumed that the lions both faced forwards on the boat (faced to the right on the starboard side and faced to the left on the port side). The lion was present on U 505 during the first three patrols, when Löwe was in command.

Peter Zschech - axe and rings

Axe emblem - When Peter Zschech assumed command, a very large axe was added to both sides of the tower. There was insufficient space to paint such a massive motif on the top half of the tower so it was added under the spray deflector. In photo 4, which shows its position and large size, it is clear that the emblem was highly visible from a distance. The axe itself was symmetrical, with the axe blade facing forward on both sides. The design of the axe was slightly different to the drawing in Högel's book and to designs which can be found on the internet.

The huge size of the axe is consistent with a new commander who wished to make his mark. The change of emblem away from the lion asserted his authority, making it clear that a new commander was now in charge. However, the use of the axe from his very popular predecessor was a smart move by Zschech. Whether this was his idea, or he was persuaded to do so, is not clear but it allowed him to impose his authority while maintaining a link with the previous incumbent. It is also reputed that the crew wore brass or aluminium axe badges on their caps at this time.

Olympic rings - During Zschech's command, it is reputed that U 505 also featured the Olympic rings emblem, derived from the Berlin Olympic Games of 1936. A number of commanders, including Peter Zschech, celebrated their inclusion in the officers' class of 1936 (Crew 36) by applying this symbol to the towers of the boats they commanded. Many boats, of different variants, all possessed this symbol: U 3, U 20, U 23, U 37, U 59, U 183, U 203, U 227, U 314, U 344, U 387, U 394, U 407, U 426, U 440, U 467, U 505, U 534, U 546, U 555, U 643, U 710, U 760, U 869, U 1230 and U 3504. Some boats had one set of rings, either above or below the spray deflector. Other boats had two sets of the symbols, one on either side of the tower. Although no photos have shown the rings on U 505, the presence of the large axe on either side would suggest a singular set of rings at the front of the tower. It is unclear whether they would be located above or below the spray deflector.



Left (8): The camouflage pattern was spotted by Jon Kelly (thanks Jon!). The position of the dark bands and the consistency of the angles suggests that the dark areas are indeed part of a camouflage scheme. The arrows point to the start and end position of the respective bands. The purple arrow points to the gaping wound to the Hudson attack which resulted from the Hudson attack while the yellow arrow shows men in a dinghy.

Camouflage pattern - Following the destruction wrought by the Hudson attack in November 1942, a massive gaping hole was left on the aft deck and upper hull of U 505. At this time dark diagonal bands were present on the upper hull and tower. The first band (see the red arrows in photo 8) was present on the tower. Most importantly, the second band, pointed to by the blue arrows, is on the hull casing in the ideal location for it to

follow on from the first diagonal band. There is a third band (see green arrows) farther forward on the hull casing. In another photo (not shown in this article) another band can be seen behind the damaged casing. The angle and positions of the bands make it likely that a camouflage scheme was employed on the boat at this time. These bands were probably painted on the boat prior to departure but another possibility is that the bands were added following the Hudson attack in the vain hope of trying to disguise the black hole. It happens that the men in the dinghy in photo 8 are roughly halfway between the second and third band, where one might expect an additional band to be painted. This photo might show the men in the dinghy in the process of applying a makeshift camouflage scheme to U 505 or, perhaps more likely, in the process of transferring supplies from U 462.

Photo 8 is almost certain to have been taken by a photographer aboard U 462, the Type XIV milch-cow (milk cow) which provided U 505 with supplies on the 22nd November 1942.

Colours with Turm II - Photo 4 (which appears earlier in this article) shows the boat in 1943 with a light grey that is likely to be the *Hellgrau 50* previously used on the boat. Another image (not shown here) of the boat with the Turm II also displays the pale, washed-out features that are reminiscent of *Hellgrau 50*.

The use of *Hellgrau 50* on the Turm II cannot be taken for granted due to the two small vessels at the top left hand corner of photo 4 (see the light blue arrows). If they are Kriegsmarine vessels then their superstructure would probably be painted in *Hellgrau 50* and their hull painted in *Dunkelgrau 51*. The upper colour of U 505 appears to be the same as the hull of the two vessels. However, the quality of the image and the questionable identity of the two vessels mean that it is impossible to make any judgements from this photo.

As previously mentioned, there was a directive in the painting regulations to paint horizontal surfaces black. In practice, there was variance as to how strictly this was followed and discrepancies in what constituted a horizontal surface. In photo 4 we can see that the top half of the magnetic compass housing (see the purple arrow) was black, as were the deck railings and the top half of the 105mm gun barrel. Following a long period in refit, and no requirement to urgently return the boat to sea, the shipyard may have been especially prudent in following the paint regulations. Later in the boat's career, grey rather than black was used on these features.

Change to darker colours - Earlier in the article we discussed a quote by Hans Göbeler in *Steel Boats*: "On July 1, U-505...[had a] fresh coat of dark grey paint". This accords with the well-known order of the 7th May 1943, which stated that only the petrol-proof camouflage colours *Schlickgrau 58*, *Blaugrau 58/1* and *Blauschwarz 58/2* were to be used as upper colours on operational U-boats. This was the only order specifically pertaining to U-boat colours. The reason given is that the High Command was worried at this time that the Allies were using infra-red sensors to detect U-boats. Presumably these paints did not reduce the infra-red signature of a U-boat. Instead, the High Command, alarmed at the number of U-boats being sunk by aircraft, must have deemed that these darker colours would render a U-boat less visible to enemy aircraft. This order seems to have been partially adhered to, since the prominence of darker colours appears to have increased following this order. However, implementation was not universal since light and medium greys were sometimes used until the war's end.

Harald Lange - patrols 12 and 13

Paint colours for patrols 12 and 13 - At the end of patrol 13, which was cut short due to an operation to rescue survivors of the torpedo-boat T25, a photo shows U 505 in a darker grey paint that may have been *Schlickgrau 58* or *Blaugrau 58/1*. It is almost certain that the upper hull would be the same paint colour at this time. There was a small element of paint peeling from the tower.

Scallop shell version 1 (patrols 12 and 13) - When Lange took over from Zschech, the axe and Olympic rings were removed in favour of two new items - the scallop shell emblem and the 2nd U-Flottille emblem. According to a forum post by Keith Gill, "A long standing rumor was that Lange was a merchant seaman pre war for the shell oil company and so took the shell logo from this experience and painted it on the tower. However other crewmembers say they simply painted it on the tower prior to Lange arriving at the boat and that it was purely a maritime related symbol, nothing else." This post can be seen at -
(<http://uboot.net/forums/read.php?3,43159,43188#msg-43188>).

The scallop shell has often been used as a symbol of heraldry, where it can sometimes be found on a shield background. The nautical connection is derived from the shell's usual habitat in the oceans around the world.

In this first version of the shell, there was *no shield background*.

2nd U-Flottille emblem (patrols 12 and 13) - Also evident in photo 9 is the 2nd U-Flottille emblem, positioned centrally on the tower below the spray deflector. In this design, a U-boat passes (from right to left) through a victory rune. Viktor Schütze, who had previously utilised the symbol aboard U 103, used it as the emblem of the 2nd U-Flottille when he became the flotilla chief. It was installed on U 505 when Lange assumed command and remained on the boat until after the capture.

Harald Lange - patrol 14 (during capture)

Upper hull during patrol 14 - Many modellers wish to depict the boat on the fateful day when it was captured. The paint colours on this date have been a subject of conjecture and debate for many years. The very rare colour video footage which shows the boat in the period directly following the capture do help us enormously, but it still remains



Above (9): U 505 enters Brest at the end of patrol 13 on the 2nd January 1944. Evident are the darkish grey paint, the first version of the scallop shell, and the 2nd U-Flottille emblem below the spray deflector. To the right, lined up on the foredeck, can be seen some of the survivors of the torpedo-boat T25.

Below left (10): According to sources, in June 1944 the carrier *USS Guadalcanal* was painted in measure MS32/4a. Although there appear to be some differences between MS32/4a and the paint scheme employed on the carrier at this time, this does not interfere with the likelihood that the stern of the carrier was painted in US Navy paint 5L (FS35526), a light grey which allows a good comparison with the upper hull of U 505.

Below right (11): This is a very rare colour image of U 505 directly after capture, when attempts were being made to save the boat and tow her to Bermuda. The rust and rust residue patterns are evident on the upper hull.

difficult to be precise about exact colours.



Above (12): The Kriegsmarine paint colours that were specified in the order of the 7th May 1943.

Right (13): Paint peeling, salt staining, rust and a general patchy appearance are all evident in this photo. We can also see that some of the waterline draught marks appear to be white. All U-boats were meant to have the marks but in some cases boats might have been rushed to sea without them. Although we cannot be certain, it appears the white marks *may* have been there on U 505. Due to very heavy weathering, some numerals look to have been covered over by plantlife or been chipped off entirely. In another photo the marks are difficult to distinguish. If modellers do choose to apply AMP waterline mark decals (which replace the inaccurate Revell examples), then care should be taken to weather the decals appropriately.



Photos 10 and 11 show video captures from the colour footage. Photo 10 shows the upper hull was markedly darker than the 5L light grey employed on the stern of the carrier. The quality of photo 11 leaves a lot to be desired yet certain key elements can be established. Firstly, on the upper hull, patches of rust residue can clearly be seen directly below the rust itself. Although the paint is peeling a little in places, it is distinctly less than on the tower. Given the dubious quality of the image, it is difficult to determine if the upper hull paint has a slight blue tinge. If so then this might suggest *Blaugrau 58/1* rather than *Schlickgrau 58* on the upper hull. Another Kriegsmarine paint, *Dunkelgrau 51* (actually a medium blue-grey) is probably too light to be a candidate.

Tower during patrol 14 - The most contentious issue is the paint colour on U 505's tower. I would like to make it clear, from the outset, that I have an *opinion* on this matter but *no definitive proof*.

All black and white photographs show a dark tower. However, since U 505 is photographed with much of her deck partially awash, with only her bow sticking out of the water, it is not easy to compare the upper hull with the tower. It is the colour video footage which is much more useful in this regard, and this footage shows, *in my opinion*, that the tower was darker than the upper hull. One particularly useful shot (see <http://flickrriver.com/photos/deckarudo/6039207629/#large>) allows a good comparison to be made between the hull and tower. Just below the eight vents on the hull casing, there is a darker area of the hull. This is not a camouflage scheme but simply a wet area of the hull. Even the wet area of the upper hull is lighter than the dry area of the tower. As for the dry area of the hull, it is markedly lighter than the tower.

This photo points towards a darker tower, but in one or two other photos the tower looks a similar shade to the upper hull. Due to their low quality, they are not in themselves of sufficient quality to provide any proof but they should not be discounted or ignored. This is an example of the complexities of assessing paint colours, where photos appear to contradict each other.

In black and white photos next to the USS *Guadalcanal*, the tower of U 505 looks about the same shade as the carrier's 5-N navy blue paint, which was slightly lighter than *Blauschwarz 58/2*. It is quite difficult to tell anything from these photos due to the very poor quality and the fact that so much paint has peeled away.

In tandem with photographic evidence, we should also evaluate this theory by asking if painting the towers darker than the hulls was an accepted practice within the *U-bootwaffe*. If this practice was commonplace then we can be more confident that this was in place on U 505. Although it might not be prudent to state that this practice was commonplace, one might argue that it was *not uncommon* for U-boats to have different coloured towers. Examples of U-boats with towers painted differently to the upper hulls include U 156, U 302, U 313, U 441, U 805 and U 858.

Another very influential factor is derived from period photos of U 805 and U 858. The most influential image is a superb colour image of U 858 (see image 14). The similarities to U 505 (and U 805) in the paint colours and condition are immediately obvious in this photo and the other black and white images. These photos provide irrefutable evidence that the towers of U 805 and U 858 were darker than their upper hulls when they were surrendered at the end of the war. As with U 505, the paint on the dark towers was peeling much more than on the upper hulls. If we look again at photo 14, we may be inclined towards *Blaugrau 58/1* on the upper hull and *Blauschwarz 58/2* on the tower. The similarities between the paint schemes of U 505, U 805 and U 858, and indeed the similar condition of the paint on these three boats, lead us towards the possibility that U 505 may have been painted very similarly to the paint colours we see in photo 14.

Author's note: In *Kriegsmarine U-Boat Colours & Markings*, I offered a suggestion that the hull of U 505 may have been *Dunkelgrau 51* and the tower *Blauschwarz 58/2*. The question mark after this suggestion shows my great uncertainty on this issue. In an earlier draft of the colours and markings article I had offered *Blaugrau 58/1* as the upper hull colour. I cannot recall why I substituted *Dunkelgrau 51* for *Blaugrau 58/1* (I probably did not have access to the colour footage of U 505 at the time) but I suspect I may have made an error. My present suggestion would be a *Blaugrau 58/1* (or perhaps a *Schlickgrau 58*) upper hull and a *Blauschwarz 58/2* tower but, given



Above (14): U 858 following the surrender in 1945. This is a very important artefact in researching U 505's paint colours during capture. The blue tinge on the hull of U 858 may suggest *Blaugrau 58/1* and the tower appears to be the dark blue grey *Blauschwarz 58/2*. The paint colours of U 505, U 805 and U 858 in the late war period all exhibit the same characteristics and may constitute the same informal paint scheme. Note that some areas of the tower are covered in rust, with others exposing the bare metal beneath.

Below (15): This photo is a leading contender in favour of the case for a darker tower. But the poor quality categorises it as supporting evidence rather than definitive proof.



the uncertainty on this subject, I would certainly not wish to argue with anybody who holds a different opinion.

Condition of the tower during patrol 14 - What can be established, beyond any doubt, is the very high amount of peeling on the tower of U 505. Although rust, salt staining and all the usual signs of wear of a boat at sea would also have been present, a large proportion of the paint had peeled from the tower. A number of photos of the boat (see <http://www.uboatarchive.net/U-505Photographs.htm>) show the extent to which the paint had peeled away from all of the outer surfaces of the tower. Any model of the boat at this time must exhibit significant paint peeling to be even remotely accurate.

The marked contrast between the amount of paint peeling from the tower and the upper hull requires scrutiny. Firstly, it should be noted that other late-war boats (particularly late-war Type IXs) also exhibited this pattern. The towers of U 805, U 858, U 870 and U 889 all exhibited paint peeling, whereas their upper hull had a near uniform paint coating with no signs of similar deterioration. This may be the result of a different type of metal plating present on the towers of U-boats. It appears that paint did not adhere to the tower plating in the same manner as was possible with the steel used on the upper hull.

Photo 14 gives readers some idea of the colours that were present when the paint peeled from the tower. Some rust patches are evident, while other areas appear to show a whitish silver colour of the metal beneath. The exposure of a light grey colour underneath is possible but it is more likely that when the paint peeled from the tower it revealed the bare metal below.

The poor quality of the paint used by U-boats in the late war period is evidenced in the interrogation report of U 66. Sunk in May 1944, survivors told their captors that the poor quality of the paint resulted in camouflage schemes only being able to last three to four weeks. A significant reduction in quality in the late war period might be expected when we consider the great difficulties encountered due to the bombing of industrial targets by the RAF and USAAF.

Scallop shell version 2 (patrol 14) - Both the 2nd U-Flottille emblem and shell were retained for the boat's final patrol. However, this patrol saw a different version of the scallop shell – this time *with* a shield background – utilised on either flank of the tower. Although a specific colour for the shield cannot be discerned from the colour video footage, it can be said that the colour was certainly not the red colour used in the Revell decal sheet. The museum boat currently has a green colour, which can also be seen on a plaque commemorating a 1980 reunion (see photo 7). The green colour used in the plaque may have been as a direct result of information provided by former crewmen of U 505. It is quite possible therefore, that the shield colour was dark green.

Another aspect is the white border around the shield. Given the dark grey paint on the tower, a white border would have been necessary to delineate the dark green shield from the dark grey tower.

2nd U-Flottille emblem (patrol 14) - This was present in the central position below the spray deflector. The condition matched the rest of the tower, with areas of the emblem peeling away from the tower.

Post-capture colours

Can do Junior (just after capture) - In reference to the “can do” motto of the *USS Guadalcanal*, American personnel painted “CAN DO JUNIOR” on the front face of the tower of U 505, just below the damaged wind deflector supports.

War bonds black scheme (1945 - 1954) - By the time the boat embarked upon a war bonds drive in 1945, the tower and upper hull were painted black. The shell emblem and 2nd U-Flottille emblem

were both painted over by the black paint. "U-505" was painted in large white block capitals on both sides of the tower so there could be no questions about the boat's identity. As each year passed, a progressively more weathered, rusty and barnacle-encrusted *Schiffsbodenfarbe III Grau* remained on the lower hull.

On the 12th August 1953, U 505 was moved into dry-dock for the first time since 1944. Having spent nine years in the water, it would have taken some time to scrape off all the barnacles, weeds and plantlife which had accumulated on the hull. A colour photo which appears in the *U-505: Extend The Experience* DVD shows the boat when it arrived in Chicago in 1954. The photo shows that the lower hull was entirely covered with rust and very little, if any, of the *Schiffsbodenfarbe III Grau* remained on the hull. What was left of this Kriegsmarine dark grey paint may have been removed in August 1953, when all the barnacles and plantlife were scraped off the hull.

Another aspect of the colour photo is the very low division between upper and lower colours. From 1944 until 1954, the lower hull was not painted. The upper hull and tower were painted black during this period, but when the black was applied it was done so when the boat was in the water. The painters simply applied the black paint down to the waterline level. The final application of black must have been completed when the boat was lying quite high in the water because the black paint extended much farther down than the normal Kriegsmarine waterline level. This produced an incorrect division line which was employed upon the boat for decades and would not be rectified until the 21st Century.

Second black scheme (1954) - To assist in the transit to Chicago, large white draught marks were added to the bow and stern in May 1954.

When the boat stopped at Cleveland on the 3rd and 4th of June 1954, an effort was made to disguise the poor technical condition and make the boat more presentable for its arrival at MSI. This was done by painting the boat in the standard black favoured by the US Navy at the time for their submarines. Since the boat was in the water at the time, only the upper hull and tower could have been painted black. "U-505" was again painted in block white capitals on the tower at this time, with additional white text below.

When Chicagoans glimpsed U 505 when it first entered their city, the boat had reasonably fresh black paint all the way down to a very low waterline level. Below this was a hull clean from barnacles but entirely covered with rust.

Light grey / black scheme (September 1954 - 1968) - Between the 19th and the 25th September 1954, the boat was repaired and repainted to make it presentable for the dedication ceremony. Since the exterior of the boat was sandblasted, all evidence of Kriegsmarine paint colours on the exterior was removed. Due to time pressures, no attempt was made to record paint colours at this time. By the 25th September 1954, the boat was in a smart new light grey scheme for her dedication ceremony. The boat had a light grey upper hull and tower, with "U-505" being painted in large black block capitals on both sides of the tower. The lower hull was painted black, with the division line between the upper and lower colours once again being markedly below the normal Kriegsmarine level.

Light grey / black scheme (1968 - 1978) - The same scheme - light grey upper hull and tower, black lower hull, and incorrect division line - was used during this period. The large US style welded waterline marks were white at this time. U-505 in black block capitals was used at this time. The metal covers on the deck were all light grey.

Light grey / black scheme (1968 - 1978) - The same scheme - light grey upper hull and tower, black lower hull, and incorrect division line - was used during this period. The large US style welded

waterline marks were either yellow or gold at this time. U-505 in black block capitals may have been used at this time. The metal covers on the deck were all light grey.

Light grey / black scheme (1978 - 1988) - The same scheme - light grey upper hull and tower, black lower hull, and incorrect division line - was used during this period. It is unclear what colour the large US style welded waterline marks were at this time. U-505 in black block capitals was probably not used at this time. The metal covers on the deck were all light grey.

Light grey / black scheme (1988 - 2004) - The same scheme - light grey upper hull and tower, black lower hull, and incorrect division line – was used during this period. Since the division line was too low, it cut directly through the anchor recess, with the anchor itself being painted black. The large US style welded waterline marks were painted black at this time. U-505 in black block capitals was **not** used at this time.

Scallop shell version 3 (1988 - 2004) - For several decades, the shell emblem was missing from U 505. At some point, probably following the 1988 and 1989 restoration, the scallop shell was reinstated upon the boat. This version did not have the additional two areas on either side of the fan, but did have the white border. The shield was mounted on a dark rectangle which never featured in wartime.

2nd U-Flottille emblem (1988 - 2004) - At some point, again probably following the 1988 and 1989 restoration, the 2nd U-Flottille emblem was reinstated. The design of the U-boat in this version is reasonably consistent with the original. However, the rune is completely white on this version whereas the original rune was black and white.

Present colour scheme (2004 - present)

Research by MSI - During the major multi-million dollar restoration project conducted in the early years of this century, the exterior of the boat was completely repainted *to depict the boat at the time of capture*. The division line was correctly placed this time, and the lower hull painted in a colour that is an extremely good approximation of *Schiffsbodenfarbe III Grau*.

The paint colours were researched in detail by the boat's then curator Keith Gill. Following publication of *Kriegsmarine U-Boat Colours & Markings* in three issues of the SubCommittee magazine, I was contacted by Keith and had the good fortune to exchange information about U-boat colours with him. It was a pleasure to discuss these matters with a genuine enthusiast who has carried out the role of curator with distinction. Although many enthusiasts were not well versed on U-boat colours at the time, Keith obviously had a good deal of knowledge on the subject. In November 2004, an online article reveals the impressive lengths which the curator went to in restoring the boat's colours. The article - *U-boat's True Identity Surfaces: Microscopic Analysis and Old Manuals Help Conservators To Restore A German Sub's Original Appearance* by Matthew V. Veazey – can still be found online today (see <http://events.nace.org/library/articles/features/uboat.asp>). In the article we learn that Keith travelled to Germany specifically to research U-boat paint colours, whereupon he found a fandeck from the 1920s (presumably a RAL fandeck) and a Kriegsmarine U-boat painting manual. He also travelled to England, where he compared the colour chips he copied in Germany to the U 534. Back in Chicago, with the benefit of a real U-boat to play with, he undertook painstaking research on interior colours and wooden deck colours. To provide some idea of the lengths the curator went to during a two-year research process, he told me that he removed “flakes of paint from each valve and electrical box, basically every surface,” and then analysed each flake under a microscope. In some areas he found five or six German layers, with another five or six US Navy or museum layers over

the top. Having analysed some 500 flakes in microscopic detail, it is fair to say he conducted this research with commendable tenacity.

Upper hull - The interior colours, lower hull colour and deck colours are not, to my knowledge, the subject of any debate. The interior colours and deck colours were particularly well researched and documented. But what has been suggested, by other modellers as well as myself, is that the upper hull and tower paint colours on the boat may not reflect the true colours when captured. First of all, let us be clear what paint colour is actually on the upper hull and tower of the real boat in MSI at present. The *U-boat's True Identity Surfaces* article states that "painters applied the original mud gray to the top and granite gray to the bottom. Gill likens mud gray to the shade of gray one would see on a river bottom." We should note that the German term "*Schlickgrau*" translates as "sludge-grey" or "mud-grey". This use of "mud-grey" to the upper hull and tower also accords with the information sent to the author by Keith. Although he did not specifically mention *Schlickgrau 58*, the term mud grey is surely a reference to the *Schlickgrau 58* paint colour used on U-boats. The choice of *Schlickgrau 58* is entirely valid, with both *Schlickgrau 58* and *Blaugrau 58/1* being sensible choices.

While at the military archives in Freiburg, Keith was able to copy the chips from an original manual which cross-referenced the paints to RAL standards. Since there is reputed to be no direct RAL equivalent for *Schlickgrau 58*, it is unclear if this paint colour was amongst the paint chips he was able to copy.

At present, the boat is illuminated by spotlights which shine from the roof of the temperature-controlled enclosure. The photos showing the boat inside the enclosure show a light grey upper hull and tower. However, it is much more helpful to look at photos of the boat in its present paint colours before it was moved indoors. (One such photo can be found at - http://web.mst.edu/~rogersda/american&military_history/Shot%203%20U-505%20in%20Chicago-2004.jpg) Without artificial lighting affecting the appearance, this photo is able to show the actual paint colours better than any indoor photo. In this outdoor photo, the upper hull and tower are **not** as light as in the indoor photos. In 2004, when Keith sent me one such outdoor photo, my first impression (before I was told by that "mud-grey" was used) was that a lighter version of *Schlickgrau 58* had been used. When comparing the outdoor shots with Kriegsmarine colour cards, the upper paint colours on the boat are not consistent with the light grey *Hellgrau 50* or the medium grey *Dunkelgrau 51* but do exhibit a shade that is reminiscent of *Schlickgrau 58*. However, the upper paint colour does look noticeably lighter than the *Schlickgrau 58* colour in the Snyder & Short Enterprises paint chip cards. Jointly researched and produced by John Snyder of White Ensign Models, these cards are regarded worldwide as the definitive guide to naval paint colours. The popular Colourcoats range of naval paints, produced and sold by White Ensign Models, naturally correspond directly to the Snyder & Short paint chips. My impression that U 505 has been painted in a shade that is somewhat lighter than *Schlickgrau 58* is, I must stress, based upon an assumption that the Kriegsmarine colours in the Snyder & Short Enterprises paint chip cards are accurate.



Above (16): This clear image shows the colour of the paint used upon the upper hull and tower of U 505 at MSI. The green shield background of the shell emblem can also be seen. Several holes punched in the side of the tower were caused by aircraft and vessels belonging to the task force which captured U 505. The tube at the left hand side contains a spare barrel for the 37mm automatic. Lastly, note how the deck railing stops abruptly just ahead of the magnetic compass housing. Originally this railing had an additional three vertical stanchions.
(Ernest Roth)

Every modeller has had to mix paints at some point or another. For many of us, mixing paints from several tinlets has proved to be a matter of trial and error. More than a few times I have successfully mixed paints in the evening only to find, the next day when the paint has dried, that my efforts to match a particular Federal Standard colour were not quite as successful as I had previously envisaged. Attempting to obtain a paint finish which matches *Schlickgrau 58* - a paint which has never been associated with a RAL equivalent - for an entire full size U-boat is a somewhat more challenging proposition requiring professional expertise. This was provided by Sherwin-Williams, who according to the aforementioned article *U-boat's True Identity Surfaces* "soon discovered that matching them [the original paint chips] to today's coating formulations would be laborious...they worked tirelessly with me [Gill] trying to match colors to sometimes conflicting information in several different paint systems". It should be noted that the boat was also given a matt finish, as was customarily applied to U-boats.

Tower colour - It is worthwhile mentioning the lack of information that was available on U-boat colours at the turn of the century. My article *Kriegsmarine U-Boat Colours & Markings* was borne out of frustration with the conflicting and often erroneous sources which did not address the subject in anything other than a cursory manner. More than a few modellers were still painting U-boat lower hulls a lovely shade of red at that time. Worse still, some were even adding a smart looking but historically inaccurate bootline. Despite many photos clearly showing dark greys, the majority of modellers painted their models light grey, with medium grey being the darkest they would venture. The use of red hulls was thankfully coming to an end but the reticence to use dark greys on models would take longer to purge. It was this mindset, where lighter greys were the established norm, which was prevalent when U 505 was painted in her current scheme. As for knowledge of U-boat towers being painted in different colours to the tower, perhaps only a smaller band of enthusiasts with particular interest in U-boat colours seemed aware of this.

The theory of a darker tower on U 505 was covered previously (within "Tower during patrol 14"). Given the great deal of ambiguity on this issue, and the lack of iron-clad photographic evidence, it would have been most problematic in 2004 to paint the real boat with a darker tower. A different coloured tower is the sort of thing visitors would notice and query. More importantly, of course, is that the theory of the darker tower may itself be incorrect. The museum staff may not have considered this theory, or they may have considered it and rejected it altogether. Although I mentioned to Keith about this theory, I thought it imprudent to solicit his opinion on this matter when the boat had already been painted.



While we may devote a lot of time and effort debating the paint colours, these considerations seem rather futile when we recall the condition of the paint on the 4th June 1944. The museum boat cannot possibly look like she was on the day of capture without rusting the upper hull and peeling much of the paint away from the tower. In a forum post (<http://www.uboot.net/forums/read.php?3,36886,36931>)

Above (17): As a final point, although the boat itself does not have a dark tower, there are two MSI museum exhibits which do show a dark tower. The first is a wall mural, and the second is a tower mock-up sitting on the floor beside the starboard side of U 505. This image is ideal in allowing us a comparison between the real tower and the tower mock-up. The mock-up is a very dark charcoal grey, not far perhaps from *Blauschwarz 58/2*, and is complete with shell emblem and 2nd U-Flottille emblem. If the real boat is painted to depict U 505 during the final patrol, why is the mock-up painted a dark grey colour?
(Ernest Roth)

the curator stated “we all know it is hard to get all the resources to agree and so I gave it my best shot considering the time and constraints I was under. It will look better and I feel good about it being like she was on the day it was captured and my guess is that if she were in port in 1944 nobody would point and say, ‘Hey look at how wrong that boat is painted’.” Given the impossibility of making a museum boat emulate the highly weathered and peeling state on the day of capture, I would concur with Keith’s sentiments and agree that the colours on the boat at present would not be amiss if the boat sailed from Brest or Lorient on a war patrol in 1944.

Scallop shell version 4 (2004 - present) - The main features of the current emblem are highly consistent with the original version seen in post-capture photos. For example, the present design depicts the fan and the scalloped ridges very well. However, the dark green shield on the current version has a thin black border surrounded by a thicker white border. Surrounding the white is an additional thin black border around the white border. The white border is prominent in period photos but neither of the black borders can be identified in the available photos. These two black borders also feature in the Revell decal sheet but are not present on the AMP replacement decal design.

The present version also has an additional two areas on either side of the fan. These two areas do not seem to be present in the post-capture photos and are not on the AMP decal design.

2nd U-Flottille emblem (2004 - present) - This current version looks accurate when compared to the wartime original. The Revell example also looks accurate, which is why we considered that a replacement was unnecessary.

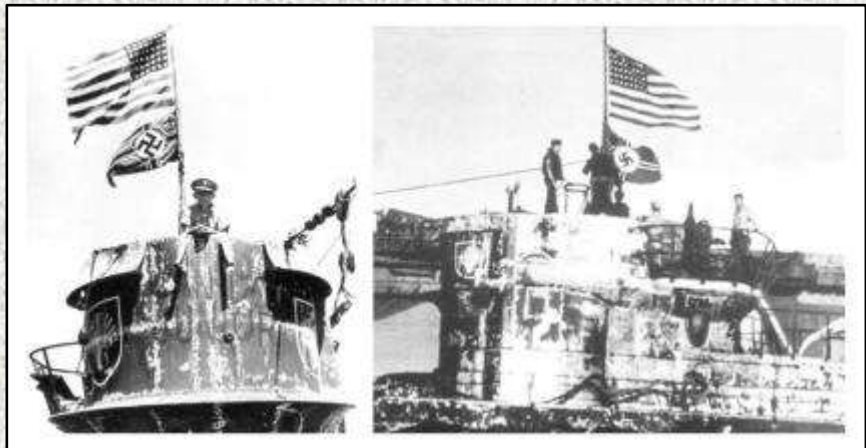
Note: For paints and emblems summary table please see Part XII.

Part XI - AMP Decals & Flags

Flags

Below (18a and 18b): The two flags flying from the periscope of the newly captured boat, with the American example positioned more prominently than the German naval flag.

Following the capture, there are memorable photos showing Captain Gallery posing on the front of the conning tower of U 505. Above his head, suspended on the attack periscope are two flags showing the previous and new owners of the boat. Naturally the US flag dominates the German Kriegsmarine flag, both in position and size.



To allow modellers to depict this scene, AMP intend to produce custom examples for both the American and German flags (with codes us505-072 and dk505-072) in the next few months. The Kriegsmarine flag was a smaller example that was flown only when the boat was at sea; a larger example was flown in port. The actual flag that we see in the photos was presented by Captain Gallery to Admiral Jonas Ingram in 1944 and currently resides in the Memorial Hall at Annapolis. A similar German flag, which was stored in the boat during the capture, can presently be seen in a glass display case at MSI in Chicago.



Top left (19): Taken by Wink Gris  of Accurate Model Parts during his visit to the boat in 2010, this Kriegsmarine flag was stored aboard U 505 and is an identical size to the smaller type Kriegsmarine flag that we see in the photos. There were four or five flags stored aboard U 505 at the time of the capture.

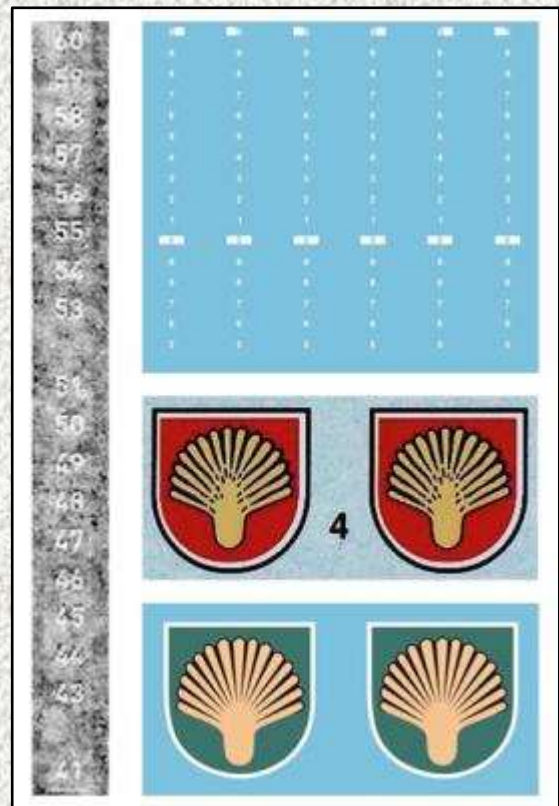
Bottom left (20): Also taken by Wink, this shows the remains of a US flag which was flown from one of the US escort vessels.

Top right and bottom right (21a and 21b): Both flag designs within the AMP range.

Replacement AMP decals

While many features of Revell's kit are commendable, some of the kit decals are entirely unusable. The waterline draught marks in the Revell decal sheet consist of the two-digit numeral system that was a feature of the Type IIs. However, all IXs (and VIIs) had the one-digit system. The AMP replacement, K-72W, was designed using information gleaned from numerous Type IX photos. It is unclear why Revell chose the two-digit system when a perfunctory check of widely-available photos clearly shows the one-digit system. In addition, only four sets of waterline marks were included in the Revell decal sheet, when nautical practice is to apply six sets to the hulls.

An incredulous decision by Revell was to choose red as the background colour of Lange's scallop shell emblem. Colour footage taken at the time shows a complete absence of red in this area. It might be noted that a very old and basic U 505 kit, in the ever popular 1/209th scale, was produced by a model company called Aurora. The moulds for this kit were taken over by Monogram, the model company which joined with Revell in 1986 to become the US-based Revell Monogram. The box art, which is the same for both the Aurora and Monogram kits, shows the boat with a red shield and U-505 in block white capitals. Whether this influenced the German based Revell when they designed the new 1/72nd U 505 is unclear, but at least the new Revell kit does not feature the U-505 in white block



Left (22): The two-digit numerals on the Revell decal sheet are completely unsuitable for a Type IX model. The two-digit system was a feature of Type IIs - not Type IXs!

Top right (23): The waterline draught mark decals available from AMP (code K-72W).

Middle right (24): The red background is highly visible on the Revell decal sheet.

Bottom right (25): The AMP scallop shell emblem decals (code T9-SHELL-72). Since the shell on the penultimate patrol did not include a shield, the AMP decals are only suitable for U 505's final patrol.

capitals that was a feature of the Aurora and Monogram kits.

The AMP replacement includes the green colour currently favoured on the boat. It should be noted that the plaque commemorating a 1980 reunion (see photo 6) shows a green background. This commemorative plaque, together with the green colour on the boat at present, influenced our colour choice when designing the decals. Another aspect that has been corrected is the black border around the edge of the emblem on the Revell sheet. Photos show that no black border existed.

The 2nd U-Flottille emblem and the “CAN DO JUNIOR” writing on the Revell decal sheet were not deemed to require replacement as they appear to correspond with period photographs.

Future AMP decals

Later in the year, it is intended for AMP to produce the following decals for Revell’s IXC kit -

U 505 axe emblem - For U 505 under Zschech.

U 505 early shell - For the scallop shell emblem used on U 505 during patrols 12 and 13. This will have no shield background.

Olympic rings - For U 505 under Zschech and the following boats –

- U 37, U 534, U 546, U 869 and U 1230 (Type IXs)
- U 3, U 20, U 23, U 59, U 203, U 227, U 314, U 344, U 387, U 394, U 407, U 426, U 440, U 467, U 505, U 555, U 643, U 710, U 760 (other types)

10th U-Flottille emblem – For the following Type IX boats with a Turm IV and 37mm automatic -

- U 170, U 510, U 516, U 539 and U 543.

Part XII - Summary Tables

The patrol numbers in the following table have been devised by the author. They include all of the aborted patrols, which are not normally included as proper patrols. The X suffix denotes a refit or time in port. For example, 3X refers to the refit period before patrol 3.

Much of the information included in this timeline is derived from *Hunt And Kill: U-505 And The U-Boat War In The Atlantic*. It is highly recommended for any enthusiast interested in any aspect of U 505. Edited by Theodore P. Savas, it includes chapters from accomplished U-boat historians with a wealth of knowledge on the subject. Some of the information below is from *Appendix B: U-505 Combat Chronology*, compiled by Timothy Mulligan. Other information was found in the Lawrence Paterson’s chapter on the combat patrols of U 505.

Additional information was sourced from other important book, *Steel Boat, Iron Hearts: A U-Boat Crewman’s Life Aboard U-505*, by Hans Göbeler and John Vanzo. Göbeler served aboard U 505 and provides excellent detail in the Turm IV fitting debate.

Other details have been determined through analysis of period photographs of the boat and the conventional fitting dates attributed within U-boat literature. The tables do NOT serve as a definitive record of the modifications of U 505, rather it is a list of the *likely* modifications and the dates they were *likely* to have been fitted given current knowledge. The paint colours are even less certain, with merely suggestions on paint colour being offered here.

U 505 Timeline					
Patrol	Start date	End date	Location	Commander	Details and changes
1X	-	Prior to 19/01/42	Kiel	Löwe	Turm 0 (original tower) with 20mm. 105mm on foredeck, 37mm on aft deck. Paint – light grey <i>Hellgrau 50</i> . Insignia – lion with small axe, on both sides directly above the front of the navigational light channels. (Löwe is lion in German, the axe for class of 1928).
1	19/01/42 Kiel	03/02/42 Lorient	Transfer passage	Löwe	-
2X	-	-	Lorient	Löwe	-
2	11/02/42 Lorient	07/05/42 Lorient	West Africa	Löwe	-
3X	07/05/42	06/06/42	Lorient	Löwe	Repairs and refitting. Diesel engines overhauled. Blanking off of <i>S-Gerät</i> bow device possibly in this refit.
3	07/06/42 Lorient	25/08/42 Lorient	Caribbean	Löwe	Broke off patrol on 31/07/42 due to Löwe's appendicitis.
4X	25/08/42	03/10/42	Lorient	Löwe / Zschech change on 15/09/42	Diesel fuel capacity increased. FuMB 1 <i>Metox</i> radar detector fitted. Biscay Cross used as an antenna. Insignia – lion removed. Large axe added on both sides of the tower, below the spray deflector. Olympic rings supposedly added in one location at the front of the tower.
4	04/10/42 Lorient	12/12/42 Lorient	Caribbean	Zschech	Problems with <i>Metox</i> on 09 and 10/11/42. Attacked by Hudson on 10/11/42. Aft deck very badly damaged. 37mm on aft deck destroyed. Replacement parts for <i>Metox</i> transferred from U 462 on 22/11/42. Paint – diagonal camouflage bands.
5X	13/12/42	30/06/43	Lorient	Zschech	Major repairs required to aft deck. Port engine replaced. Turm II fitted (with single 20mm on upper platform and single 20mm on lower platform). 105mm on foredeck retained. New 37mm on aft deck (with different mount). Extendable rod antenna removed. Covers for torpedo storage tubes changed. Two hydrogen bottles (for FuMT 2 <i>Aphrodite</i> or weather balloons) on upper platform. <i>Bold</i> anti-sonar decoy system fitted. FuMO 30 radar fitted on housing on port side.
					Photo during practice run shows Turm II. Paint – probably <i>Hellgrau 50</i> .

Accurate Model Parts

					<p>By late May, Turm II changed to Turm IV (with two twin 20mms on upper platform and Vierling on lower platform). 105mm deck gun removed from foredeck. 37mm deck gun removed from aft deck. Two FuMT 2 <i>Aphrodite</i> bottles removed from the tower, possibly at this stage. Six bottles added under floor of lower platform. Paint – by 01/07/43 changed to a darker grey.</p>
5	01/07/43 Lorient	02/07/43 Lorient	Bay of Biscay	Zschech	Aborted patrol due to leak on first test dive.
6	03/07/43 Lorient	13/07/43 Lorient	Bay of Biscay / N Atlantic	Zschech	Problems with <i>Metox</i> , hydrophones and radio. Large oil leak after being damaged by depth charges on 08/07/43. Patrol aborted.
7X	14/07/43	31/07/43	Lorient	Zschech	Corrosion of gaskets and batteries rectified. Suspicions this had been caused by battery acid being poured over them (sabotage). According to <i>Steel Hearts</i> , the 37mm automatic replaces the <i>Vierling</i> in this refit.
7	01/08/43 Lorient	02/08/43 Lorient	Bay of Biscay	Zschech	Cracking noises in hull identified during test dive. Patrol aborted.
8X	03/08/43	13/08/43	Lorient	Zschech	Problems with cracking noise identified, with sabotage suspected again.
8	14/08/43 Lorient	15/08/43 Lorient	Bay of Biscay	Zschech	Banging noises in hull identified during test dive. Air intake duct damaged. Patrol aborted.
9X	16/08/43	20/08/43	Lorient	Zschech	Repairs to air intake duct. Casing on torpedo storage tube fixed.
9	21/08/43 Lorient	22/08/43 Lorient	Bay of Biscay	Zschech	Oil leak and noises in hull identified again during test dive. Patrol aborted.
10X	23/08/43	17/09/43	Lorient	Zschech	A hole was found to have been drilled in a fuel bunker (sabotage once more). <i>Metox</i> removed. FuMB 8 <i>Zypern</i> (also known as <i>Wanze G1</i>) radar detector fitted.*
10	19/09/43 Lorient	30/09/43 Lorient	Bay of Biscay / North Atlantic	Zschech	Starboard exhaust valve not watertight - repaired on 19/09/43. On 23/09/43, following a crash dive, motor and ballast pump not functioning. Pump could not be fixed. Patrol aborted.
11X	01/10/43	08/10/43	Lorient	Zschech	Main ballast pump and other problems fixed. FuMB 7 <i>Naxos</i> radar detector fitted (in addition to <i>Wanze</i>).*
11	09/10/43 Lorient	07/11/43 Lorient	Bay of Biscay / N Atlantic	Zschech / Meyer	Zschech commits suicide on 24/10/43. First Watch Officer Paul Meyer assumes command and returns the boat to port.
12X	08/11/43	20/12/43	Lorient	Lange assumes command on 18/11/43	Refit and repairs. Conventional time period for a change from <i>Vierling</i> to 37mm automatic.* Ready container with a spare 37mm barrel fitted.* Highly likely that FuMB 10 <i>Borkum</i> was also fitted, either in this or the preceding refit. FuMB 9 <i>Wanze G2</i> probably replaced FuMB 8 <i>Wanze G1</i> . Paint - tower remains a darker colour, perhaps

					<p><i>Schlickgrau 58 or Blaugrau 58/1</i>. Upper hull presumably the same paint colour. Insignia - axe and rings removed. First version of the scallop shell added (with no shield background or white border) to both sides. 2nd U-Flotilla insignia added in one location (at the front of tower, below spray deflector).</p>
12	20/12/43 Lorient	21/12/44 Lorient	Bay of Biscay	Lange	Leak during practice dive. Patrol aborted.
13X	21/12/43	24/12/43	Lorient	Lange	Leak found in flange thought to be due to deliberately faulty welding (sabotage).
13	25/12/43 Lorient	02/01/44 Brest	Bay of Biscay / N Atlantic	Lange	On 28/12/43, diverted on rescue operation. Returned to port with 34 survivors. On 02/01/44, fire in motor. When returning to port, starboard forward diving plane and shaft damaged in mooring accident.
14X	02/01/44	16/03/44	Brest	Lange	Refit and repairs. Diving plane and shaft repaired. New T-5 torpedoes loaded. <i>Balcongerät</i> fitted. Improved version of <i>FuMB 7 Naxos</i> fitted. <i>FuMT 1 Thesis</i> decoy probably added. Tower painted in a dark grey, perhaps <i>Blauschwarz 58/2</i> . Upper hull an unidentifiable medium to darkish grey colour, possibly <i>Blaugrau 58/1(?)</i> . Second version of the scallop shell added (with a dark shield and a white border around shield) to both sides. 2 nd U-Flotille insignia retained
14	16/03/44 Brest	04/06/44	West Africa	Lange	Problems with radar. Bow cap on torpedo tube II jammed on 30/05/44, then cleared. Boat damaged during capture on 04/06/44. Upper hull paint weathered and rusting but not peeling. Tower paint very badly chipped and peeling. After capture, "CAN DO JUNIOR" painted, possibly in red, in capitals letters on the front of the tower (above spray deflector).
* Fitting of 37mm automatic, <i>Wanze</i> and <i>Naxos</i> differs according to sources.					

U 505 features per individual patrol																	
Hull																	
Feature	L	C	1	2	3	4	X	5	6	7	8	9	10	11	12	13	14
<i>S-Gerät</i> bow – not blanked	Y	Y	Y	Y													
<i>S-Gerät</i> bow – blanked					Y	Y	?	?	?	?	?	?	?				
<i>S-Gerät</i> bow – removed							?	?	?	?	?	?	?	P	P	P	Y
<i>Balcongerät</i>																	Y
A-shaped rudder support	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Deck																	
Feature	L	C	1	2	3	4	X	5	6	7	8	9	10	11	12	13	14
Breakwaters	Y																
Aft jumping wire supports								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Torpedo storage tube covers	Y	Y	Y	Y	Y	Y											

(early arrangement)																		
Torpedo storage tube covers (late arrangement)								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tower																		
Feature	L	C	1	2	3	4	X	5	6	7	8	9	10	11	12	13	14	
Turn 0	Y	Y	Y	Y	Y	Y												
Extendable mast antenna	Y	Y	Y	Y	Y	Y												
Air intakes on both sides	Y	Y	Y	Y	Y	Y												
Air intake on one side								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Turn II								Y										
Turn IV									Y	Y	Y	Y	Y	Y	Y	Y	Y	
Watertight ammo containers									Y	Y	Y	Y	Y	Y	Y	Y	Y	
Lattice mesh grill									Y	Y	Y	Y	Y	Y	Y	Y	Y	
Armament																		
Feature	L	C	1	2	3	4	X	5	6	7	8	9	10	11	12	13	14	
20mm on tower (Turn 0)	Y	Y	Y	Y	Y	Y												
105mm on foredeck	Y	Y	Y	Y	Y	Y	Y											
37mm semi-auto aft (V1)	Y	Y	Y	Y	Y	Y												
37mm semi-auto aft (V2)								Y										
1 X 20mm on both Turn II platforms								Y										
2 X twin 20mm (Turn IV)									Y	Y	Y	Y	Y	Y	Y	Y	Y	
1 X Vierling (Turn IV)*									Y	Y	Y	Y	Y	Y				
1 X 37mm auto (Turn IV)*																Y	Y	
* Conventional timeframe for change of Vierling to 37mm shown here																		
Radar																		
Feature	L	C	1	2	3	4	X	5	6	7	8	9	10	11	12	13	14	
FuMO 30								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
FuMB Ant 5 <i>Samoa</i>								?	?	?	?	?	?	?	?	?	Y	
Radar receivers																		
Feature	L	C	1	2	3	4	X	5	6	7	8	9	10	11	12	13	14	
FuMB 1 <i>Metox</i>								Y	Y	Y	Y	Y	Y					
FuMB Ant 2 <i>Biskayakreuz</i>								Y	Y	Y	Y	Y	Y					
FuMB 8 <i>Wanze G1</i>														Y	Y			
FuMB Ant 3 <i>Bali I</i>														Y	Y	Y	Y	
FuMB 7 <i>Naxos</i>															Y	Y	Y	
FuMB Ant 11 <i>Finger</i>															P	P	P	
FuMB 10 <i>Borkum</i>															P	P	P	
FuMB 9 <i>Wanze G2</i>																Y	Y	
* Conventional timeframe for <i>Wanze</i> and <i>Naxos</i> shown here																		
Decoys																		
Feature	L	C	1	2	3	4	X	5	6	7	8	9	10	11	12	13	14	
<i>Bold</i>								Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
<i>Aphrodite</i> bottles on tower								Y										
<i>Aphrodite</i> under tower deck									P	P	P	P	P	P	P	P	Y	
<i>Thesis</i>																	?	
L = Launch, C = commissioning, X = sailing during refit 5X (with a Turn II) Y = yes, P = probable, ? = uncertain																		

Other features not mentioned in summary tables -

- Exhaust outlet possibly altered at some stage.
- KDB removal probably removed in 1942 or 1943.

Armament designations				
Weapon	Gun designation	Mount designation	Turm	Position
105 mm deck gun	10.5cm SK C/32	U-boat LC/36	0 / II	Foredeck
37mm semi-automatic	3.7cm SK C/30	LC/39	0	Aft deck
Single 20mm	2cm Flak C/30	L30/37	0	Rear of Turm 0
37mm semi-automatic	3.7cm SK C/30	L30/37 (?)	II	Aft deck
Single 2cm on both platforms *	2cm Flak C/38	L30/37	II	One on upper platform, one on lower platform
2 X twin 20mm	2cm Flak Zwilling C/38 II	M 43 U	IV	Both on upper platform, side by side
<u>Vierling</u>	2cm Flak Vierling C/38	M 43 U	IV	Lower platform
<u>37mm automatic</u>	3.7cm M 42U	LM 42 U	IV	Lower platform

* May have been the earlier Flak C/30 version

U 505 radar and radar warning						
Type	On U 505?	Refit	Refit start	Refit end	Associated antenna	F / R
FuMO 29	N?	-	-	-	12 dipoles at front of tower	F
FuMO 30	Y	5X	13/12/42	30/06/43	Mattress in box on port side	F
FuMO 30	?	5X or later?	?	?	FuMB Ant 5 <i>Samoa</i> added to mattress?	F
FuMB 1 <i>Metox</i>	Y	4X	25/08/42	03/10/42	FuMB Ant 2 <i>Biskayakreuz</i>	R
FuMB 9 <i>Wanze G1*</i>	Y	10X	23/08/43	17/09/43	FuMB Ant 3 <i>Bali 1</i>	F
FuMB 7 <i>Naxos*</i>	Y	11X	01/10/43	08/10/43	FuMB Ant 3 <i>Bali 1</i>	F
					FuMB Ant 11 <i>Finger</i> (?)	R
FuMB 10 <i>Borkum</i>	P	12X	08/11/43	20/12/43	FuMB Ant 3 <i>Bali 1</i>	F
FuMB 9 <i>Wanze G2</i>	P	12X	08/11/43	20/12/43	FuMB Ant 3 <i>Bali 1</i>	F
Improved FuMB 7 <i>Naxos</i>	Y	14X	02/01/44	16/03/44	FuMB Ant 3 <i>Bali 1</i>	F
					FuMB Ant 11 <i>Finger</i> (?)	R

F / R refers to whether the antenna was fixed (F) or removable (R). When the boat dived, the removable antennae had to be disconnected from the tower and taken inside the boat.

* Sources vary on fitting date. Conventional dates given here. In *Steel Boats*, Hans Göbeler states that FuMB 7 *Naxos* was fitted in refit 8X (early August) and that FuMB 9 *Wanze* (version not specified) was fitted in refit 10X.

U 505 colours and emblems per individual patrol																	
Upper hull paint colours																	
Feature	L	C	1	2	3	4	X	5	6	7	8	9	10	11	12	13	14
Light grey hull and tower (probably <i>Hellgrau 50</i>)	Y	Y	Y	Y	Y	Y	Y										
Camouflage bands						Y											
Darkish grey hull and tower								Y	Y	Y	Y	Y	Y	Y	Y	Y	
Darkish grey hull with a darker grey tower																	Y
Insignia																	
Feature	L	C	1	2	3	4	X	5	6	7	8	9	10	11	12	13	14
Lion (Löwe)		Y	Y	Y	Y												
Large axe (Zschech)						Y	Y	Y	Y	Y	Y	Y	Y	Y			
Olympic rings (Zschech)						P	P	P	P	P	P	P	P	P			
2 nd U-Flottille (Lange)															Y	Y	Y
Scallop V1 (Lange)															Y	Y	
Scallop V2 (Lange)																	Y
L = Launch, C = commissioning, X = sailing during refit 5X (with a Turm II) Y = yes, P = probable, ? = uncertain																	

U 505 post-capture colours and emblems										
Paint colours										
Feature	12	13	14	1945 - 1954	June 1954	Sep 1954 - 1988	1988 - 2004	2004 - 2014	Rev- ell decal	AMP decal
Tower	BG	BG	BS	B	B	LG	LG	S58*2		
Upper hull	BG	BG	BG	B	B	LG	LG	S58*2		
Lower hull	SB	SB	SB	SB	SB*1	B	B	SB		
Waterline level (L = too low)				Y	Y	Y	Y			
U-505 in white capitals (tower)				Y	Y					
U-505 in black capitals (tower)						Y				
Large white US waterline marks					Y *3	Y *4				
BG = <i>Blaugrau 58/1</i> , BS = <i>Blauschwarz 58/2</i> , SB = <i>Schiffsbodenfarbe III Grau</i> , LG = light grey, B = black, Y = yes SB*1 - Very little, if any, <i>Schiffsbodenfarbe III Grau</i> remained on very rusty lower hull by 1954 S58*2 - <i>Schlickgrau 58</i> (lighter museum version) *3 - Waterline draught marks added May 1954 *4 - Waterline draught marks were yellow or gold in 1977										
Scallop shell										
Feature	12	13	14	1945 - 1954	June 1954	Sep 1954 - 1988	1988 - 2004	2004 - 2014	Rev- ell decal	AMP decal
On boat	Y	Y	Y				Y	Y		
Version	V1	V1	V2				V3	V4		
Peeling			Y							
Shield			Y				Y	Y	Y	Y
Shield colour			G				G	G	R	G

Extra areas*								Y		
Background rectangle							Y			
Thin black border around shield								Y	Y	
White border			Y					Y	Y	Y
Second thin black border (around white border)								Y	Y	
Extra parts* = two extra areas on either side of the fan G = presumed to be green, R = red										
2nd U-Flottille emblem										
Feature	12	13	14	1945 - 1954	June 1954	Sep 1954 – 1988	1988 - 2004	2004 - 2014	Rev-ell decal	AMP decal
On boat	Y	Y	Y				Y	Y	Y	
Peeling			Y							
Rune all white							Y			

Part XIII - Acknowledgements, References & Sources

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- <http://www.uboatarchive.net/U-67INT.htm> (U 67)
- <http://www.uboatarchive.net/U-515INT.htm> (U 68 and U 515)
- <http://www.uboatarchive.net/U-257INT.htm> (U 91, U 257, U 358 and U 744)
- <http://www.uboatarchive.net/U-118INT.htm> (U 118)
- <http://www.uboatarchive.net/U-128INT.htm> (U 128)
- <http://www.uboatarchive.net/U-135INT.htm> (U 135)
- <http://www.uboatarchive.net/U-164INT.htm> (U 164)
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