Kriegsmarine U-Boat Colours & Markings

by Dougie Martindale

The following article attempts to provide a general guide to the colours used upon the German U-boats of the Second World War. It was published complete with 51 black and white photographs in the September 2004 (#58), December 2004 (#59) and March 2005 (#60) issues of the SubCommittee Report. This is a quarterly magazine published by the SubCommittee, a not-for-profit organisation of 892 members worldwide who share an interest in submarines, primarily the building of radio-controlled submarine models. Their website can be found at http://www.subcommittee.com/

In the course of researching this article, two editions (November 1941 and July 1944) of *Allgemeinen Baubestimmungen* (Building Regulations Order) Nr. 31 - a detailed painting regulation which specified the paints that were to be applied to Kriegsmarine vessels - were kindly sent to me by David E. Brown. Primary data was gleamed wherever possible from these editions, and the U-boat section of the March 1940 edition, of this regulation. I endeavoured to find more primary sources by requesting copies of other regulations from the Bundesarchiv, but my request did not bear fruit. I also corresponded with gentlemen from the RAL Institute, Snyder & Short Enterprises and authors who have published material in relation to Kriegsmarine paint colours. Discussions on U-boat colours with many modellers and enthusiasts via email and internet forums also proved to be informative. The gentlemen to whom I am particularly obliged are listed in the acknowledgements section.

NB. In order to keep this pdf file small enough to be downloaded by dial-up users, the quality of the photos has had to be reduced. For readers who are interested in accessing high quality versions of these photos, the books from which they originated are listed after the caption. Note also that most of these photos are different to the 51 black and white photos which feature in the SubCommittee article. Most of the sources for the included photos are provided, while the side profile drawings are by the author.

Difficulties in determining U-boat colours

Several combined factors hinder the investigation of the colours used upon Kriegsmarine U-boats, and prevent a resolution to fundamental questions such as the exact colour of standard Kriegsmarine paints. Although many of the same factors are present in the assessment of Luftwaffe colours, this subject has at least been resolved to a level which satisfies most modellers and Luftwaffe enthusiasts. The same cannot be said of the colours used upon the German U-boats of World War II.

Documentation

Many of the documents and regulations which would have been of help to us in analysing Kriegsmarine colours were destroyed by Allied bombing. Still more were deliberately destroyed at the end of the war. Luckily some material was captured by the Allies, and so survived. These were gradually returned to Germany over a period of time. The documents included *Allgemeinen Baubestimmungen* (Building Regulations Order) Nr. 31, a detailed painting regulation which specified the paints that were to be applied to Kriegsmarine vessels. Also included were three colour cards - TL-F1 to TL-F3 - which had been in use at the Wilhelmshaven shipyards in 1944. Though these colour cards are a great help, it is not possible to precisely reproduce the colour of the Kriegsmarine paints used upon World War II U-boats from them since the colour cards have changed in the many years since they were produced.

On the colour cards and the 1944 edition of Nr. 31, the colour of the Kriegsmarine paints were cross-referenced to the nearest RAL codes. The *Reichsausschuss für Lieferbedingungen* - RAL - (Committee of the German Reich for Terms and Conditions of Sale) had been founded by the private sector and the German government in 1925. RAL's original task had been to standardise precise technical terms of delivery and sale of colours for the purpose of rationalisation. The initial range of 40 RAL colours was introduced in 1927, many years after the First World War Imperial High Seas Fleet had been using *Hellgrau 50* and other German naval paints on their battleships. These same German naval paints were used in the Second World War Kriegsmarine. As the German naval paints pre-dated the foundation of the RAL, it follows that these paints cannot have had an exact RAL equivalent. The RAL codes that were cross-referenced to the German naval paints in the painting regulations were the **closest match** to them rather than a direct match.

By the late 1930s, the RAL Register numbered more than 100 shades. In 1939 and 1940 the Register was revised, and re-named RAL 840R (R = revised). This colour collection was re-examined in 1953, when many colours were scrapped. The scrapped colours included those which had been in military use in the Third Reich. A further review took place in 1961 and again in 1976, when an internationally used colour measurement system was laid down. Due to environmental issues, certain pigments in use in the 1940s are not allowed to be used today. Pigments are unique, and although RAL tried to obtain the best match for their older colours, certain slight colour changes between today's RAL colours and those of the 1940s are inevitable. This, for us, equates to a further variance between the colour of the Kriegsmarine paints and today's RAL colours.

Photographs

The assessment of vintage colour photos of Kriegsmarine U-boats is fraught with difficulties. The more primitive technology involved in colour photography of the 30's and 40's means that they were not even reliable documents when they were taken. They have also suffered with age during the sixty years that have passed since they were taken. Even modern colour photography has its traps. The same scene taken with the same camera under the same lighting conditions but with film from

different manufacturers can produce different results. Some films can produce a green tone, whereas others can produce a blue tone. The colour film used in Germany during WWII, developed by Agfa, tended to produce a blue tone. It is also possible that some of these "colour" photographs may be black and white photos that have been coloured by hand.

Though there are many black and white photographs available to us, determining colour shades from them is not possible. Variances in the light conditions when the photograph was taken, the different types of film used, the exposure of the photo, and the variations in printing methods all make this exercise problematic. For those photos that are viewed on a computer, extra problems present themselves. The settings that were in place during the scanning process, the software used to view the photo and the monitor settings can all alter the colours.

Paint Quality

Due to the different ingredients, binders and production methods used, the colour reproduction of an established shade during the 30's and 40's did not have the quality we expect today. German paints during this period were commonly mixed with local pigments, and emphasised durability and chemical resistance over colour fidelity. Paint includes binders, solvents, colours (pigments and fillers) and additives, and variances occur according to how these ingredients are mixed, and how paint is applied. U-boats were needed at sea, and time spent in shipyards and harbours was minimal. The obvious conclusion is that during hasty refits paints would not always be mixed or applied according to established procedures. Such common practices as the regulation thinning might be overlooked, thus causing the resulting paint to vary in colour. Shipyards would only have been given a rough guide to the standard colour, which they would replicate with what colours were available to them at the time. Obtaining a colour match was of far less importance than protecting against corrosion, which was the primary reason for applying paint.

Another troublesome problem lies with the shortages incurred due to wartime conditions. These shortages, which became more acute as the war progressed, limited the choice of colours available. **Though standard colours were often used during the early stages of the war**, painting became less and less of a priority as the war progressed. By 1943, the Kriegsmarine had far more pressing matters to attend to than maintaining a consistent paint scheme throughout its U-boat fleet. Given that the paint itself changed in appearance as the U-boat became weathered, the greys seen upon late-war U-boats would have varied so much that it might not appear as if the colours used on these U-boats were standardised at all.

The supply problems are evidenced in the 1944 painting regulations, which called for the greatest possible savings with respect to painting. Painting was only done where necessary at that time; it was not to be done merely to keep vessels looking pretty. The regulations also stated that when paint must be applied, it should be done at the smallest possible expenditure in terms of materials and work. The July 1944 painting regulations lifted the mixing prohibition, which had banned the mixing of batches of different coloured paints. They also called for the top coat of paint,

relevant for appearance only, to be reduced from two coats to one. This affected the transition from a dark colour to a light colour, as the darker colour would show through from underneath.

Summary Of Identification Problems

When the above problems have been taken into account, it follows that a scientifically precise reproduction of the colours used upon the U-boat fleet is impossible today. Adherence to RAL or Federal Standard codes is neither practical, nor necessary, and modellers have a large tolerance when selecting the colours to use on their models.

However, even though we can't accurately reproduce these colours, we do know roughly what colour each Kriegsmarine paint should have been under ideal conditions. If a variety of photographs taken under different lighting conditions of a particular U-boat are available to us, then we may be able to guess which Kriegsmarine paint was used upon this U-boat. The modeller or enthusiast who has studied Kriegsmarine paint colours is naturally better prepared to make an educated guess. This highly subjective, and often frustrating, exercise often does not yield any definitive answers. Once the modeller has guessed (for it is a matter of guesswork) which Kriegsmarine paint may have been used, I suggest that they should choose a colour close to the appropriate RAL code for that Kriegsmarine paint.

Standard Kriegsmarine paints

The names of Kriegsmarine paints were, not surprisingly, in German. The translations below of the German terms for colours will help those of us who are unfamiliar with this language.

grau=grey grün=green blau=blue braun=brown oliv=olive weiß=white rot=red schwarz=black schlick=mud hell=light mittel=medium dunkel=dark

The list below includes most of the Kriegsmarine paints that were used upon the U-boat fleet. The number after the name is the DKM (Deutsche Kriegsmarine) designation.

Hellgrau 50 (RAL7001)

This light grey, also called *Silbergrau* (silver grey) or *Hellgrau 4*, was used upon the superstructures of pre-and early-war surface vessels.

Dunkelgrau 51 (RAL7000)

Even though *Dunkelgrau* means "dark grey", this was a medium blue-grey. It has been referred to as *Fehgrau* (squirrel grey) and *Dunkelgrau 3*. It was used upon the upper hull sides of pre-and early-war surface vessels.

Dunkelgrau 52 (RAL7024)

This dark neutral grey was a little lighter than *Schiffsbodenfarbe III Grau*. It has also been referred to as *Graphitgrau* (graphite grey) and *Dunkelgrau 2*.

Dunkelgrau 53 (RAL7016)

This paint was the same colour as *Schiffsbodenfarbe III Grau*, but did not contain any anti-fouling ingredients. It has also been referred to as *Anthrazitgrau* (anthracite grey) and *Dunkelgrau 1*.

Schiffsbodenfarbe III Grau (RAL7016)

The DKM number for this very dark grey anti-fouling paint was 23a and 23b. It was also known as *Wasserlinienfarbe W.L. III Grau* and *Anthrazitgrau* (anthracite grey). This was the same colour (RAL7016) as *Dunkelgrau 53*/*Dunkelgrau 1*, but included anti-fouling ingredients in the paint.

The following three petrol-proof camouflage paints had no RAL equivalent codes given in the painting regulations.

Schlickgrau 58

Schlickgrau, which means "mud-grey", was a medium to dark grey with a hint of green.

Blaugrau 58/1

A medium to dark grey with a hint of blue.

Blauschwarz 58/2

A very dark blue.

Suitable paints for these colours are included in the table below. The Colourcoats range was produced by John Snyder of White Ensign Models (http://whiteensignmodels.com). As he participated in producing the Snyder & Short Enterprises paint chip cards, the Colourcoats paints correspond directly to the Snyder & Short paint chips. The JPS Modell acrylic paints can be found at - http://www.jpsmodell.de/shop/jpswn_e.htm.

Paint, RAL and Federal Standard matches for Kriegsmarine paints								
	Hellgrau 50	**Hellgrau 50 (alt)**	**Dunkelgrau 51**	**Dunkelgrau 52**	**Schiffsboden-farbe 111 Grau**	**Schlickgrau 58**	**Blaugrau 58/1**	**Blau-schwarz 58/2**
Colour	Light grey	Light grey	Medium blue-grey	Dark grey	Dark grey	Medium-to-dark grey with green	Medium-to-dark grey with blue	Blue-black
RAL code	7001	7038	7000	7024	7016	-	-	-
Nearest FS code	36375	36492	35237	36076	in between 36076 and 35042	Slightly darker than 36134	darker than 36152	35044
Colourcoats	KM01	KM13	KM02 (*)	KM06	KM05	KM11	KM12	-
JPS	91-004	-	91-003	91-002	91-001	91-029	91-030	91-031
Xtracolor	X255 (RAL7001) X136 (FS16375)	X221 (RLM 63)	X126	-	X802 (RAL7016) X128 (FS16076)	-	X254	-
Humbrol	127	147 or 166	145	67	123	78 + 31	79	15 ($)
Revell	374	76 (£)	57 (£)	74	78	47	77	350 ($)
Testors' Model-Master	MM1728 (FS36375)	-	MM1721 (FS35237)	-	MM2101 (RAL7016)	-	-	-
* too much blue		£ add white		$ add black				

NB. The Federal Standard codes are only the **nearest** codes to the RAL codes, which are themselves only cross-references to the original Kriegsmarine paints. It must again be stated that adherence to the RAL or Federal Standard codes are not necessary by modellers. *Dunkelgrau 51*, etc. were paints, not colours, and thus varied to a degree in colour. The variation in colour between the *Dunkelgrau 51* paint used by one yard to that of another yard was much greater than we would expect today. The weathering suffered by a U-boat would further alter the colour. The "*Hellgrau 50* (alternative)" colour is explained later in the *Hellgrau 50* section.

I have been unable to ascertain whether the other Kriegsmarine colours in the table below were ever used on U-boats. These colours were specified in the November 1941 painting regulations.

Other Kriegsmarine colours		
31/1	*Hellgrau*	Light grey
31/2	*Dunkelgrau*	Dark grey
32/1	*Hellgrün*	Light green
32/2	*Dunkelgrün*	Dark green
32/3	*Olivgrün*	Olive green
32/4	*Hellbraun*	Light brown
32/5	*Dunkelbraun*	Dark brown
32/6	*Rosa*	Pink
32/7	*Blau*	Blue

There were also three "Norwegian" colours which were based on Korvettenkapitän Dechend's 1942 memorandum. Again, I have not been able to determine whether they were ever used upon U-boats. These were –

Dunkelblaugrau (dark blue grey, FS35044)
Mittelblaugrau (medium blue grey, FS35240)
Hellblaugrau (light blue grey, FS35488)

Kriegsmarine colours can be found in the two-part set of paint chip cards produced by Snyder & Short Enterprises. These are the best reproductions of the colours of the Kriegsmarine paints that are available to us at present. The cards, available from http://www.shipcamouflage.com/ and http://whiteensignmodels.com, include actual paint chips rather than printed inks. They were produced from research materials generated by Flak Pletscher, the authors Dieter Jung, Arno Abendroth and Norbert Kelling and their book *Anstriche und Tarnanstriche der deustschen Kriegsmarine* (Painting and Camouflage of the German Navy) Second Edition (Bernard & Graefe Verlag, 1997), and archival chips and material sent to the RAL Institute. The latter material had been in use by the *Kriegsmarinewerft Wilhelmshaven* shipyard in 1944. The colours in the above book were based on an examination of colour cards that were returned to Germany by the Russians in the 1990s.

Above: The colours in the above guide are based upon the RGB (red, green, blue) values of the RAL colours. These values were obtained from a diskette purchased

from *Multicolor UK Ltd*., RAL's sales partner in the UK. For the Kriegsmarine colours which had no RAL code associated with them (the bottom three), the colours were matched as best as possible from the two-part set of Kriegsmarine paint chip cards produced by *Snyder & Short Enterprises*. Note that variances will occur due to monitor settings.

Hellgrau 50

In the many available photos of pre- and early-war Kriegsmarine battleships, there is often quite a contrast between the light grey *Hellgrau 50* paint used on the superstructures and the medium blue-grey *Dunkelgrau 51* paint used upon the upper hull sides. This contrast is usually greater than the contrast between RAL7001 and RAL7000, the RAL codes assigned to these paints in the 1940s. In addition, the light grey *Hellgrau 50* looks almost white in photos where direct sunlight is present, and reports from early in the war noted that the light grey superstructure shined almost white in bright weather conditions. These points have caused me to wonder if the *Hellgrau 50* paint was actually quite a bit lighter than the RAL7001 colour assigned to it. It should be noted that others who have studied Kriegsmarine colours have, independently of myself, come to ponder this same question.

Above: This 1940 colour photo of the mighty Kriegsmarine battleship *Bismarck* is useful to us because the paint regulations specify the paint colours we see before us. The hull is *Dunkelgrau 51* and the superstructure – looking very light under the shining sun – is *Hellgrau 50*. The bootline just above the water is not black but the dark grey *Wasserlinienfarbe W.L. III Grau*. This paint has the same number, 23b, as the paint used on the lower hulls of U-boats, *Schiffsbodenfarbe III Grau.* They are in fact the same paint, with the same colour (RAL7016), merely with different names.

Above: Comparisons between the *Bismarck* photo and this 1942 photo, also taken in strong sunlight, show similarities between paint colours. The medium blue-grey colour on the boat on the front right (U 335), and on the VII and IX (U 163) in the second row, is similar to the *Dunkelgrau 51* hull of the *Bismarck*. The light grey on the camouflaged U 253 on the front left, and the two U-boats in the third row, appear similar to the *Hellgrau 50* on the *Bismarck*'s superstructure. Note also the wooden deck colour, covered later in the article.
Photo source: Jung, Dieter, Abendroth, Arno and Kelling, Norbert. *Anstriche und Tarnanstriche der deutschen Kriegsmarine* (Painting and Camouflage of the German Navy). Bernard & Graefe Verlag, 1997.

During 1941 ships such as the *Bismarck*, the *Prinz Eugen* and the *Lützow* appeared in "Baltic stripes" camouflage. These ships had black and white stripes painted over their *Hellgrau 50* superstructures and *Dunkelgrau 51* upper hulls, plus dark grey areas at their bows and sterns. The S&S paint chip cards have separate chips for the colours used in this Baltic scheme. They are so much lighter than the normal 50/51 colours that I originally assumed that paints with completely different Kriegsmarine codes had been used. I came to learn, somewhat frustratingly, that *Hellgrau 50* and *Dunkelgrau 51* were used in this Baltic scheme, but that the colour of the *Hellgrau 50* and *Dunkelgrau 51* paints used in the Baltic scheme varied from the RAL7001 and RAL7000 codes normally associated with these Kriegsmarine paints.

The basis for the "Baltic" colours in the S&S paint chip cards came from two drawings. The first drawing, found in the Bundesarchiv by the author Hans Georg

Prager, was of the *Lützow*, and the second drawing was of a Type 35/37 Torpedoboat. They both call for the *Hellgrau 50* superstructure, which according to the official reckoning should be RAL7001, to be RAL7038. Though these are unofficial paint matches, they should certainly be taken into consideration as they accord with the very light grey often seen in colour and black and white photos of *Hellgrau 50*, and with the early reports of "superstructures shining almost white".

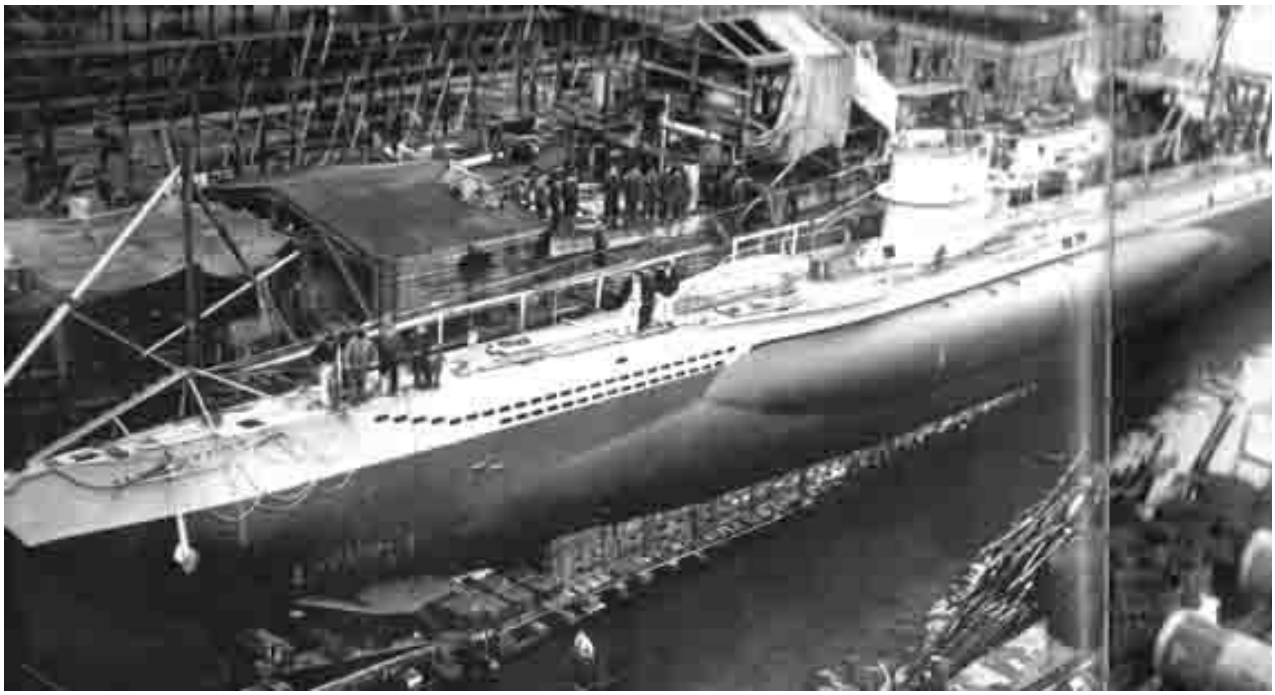
Having carefully considered the above information, I believe that the *Hellgrau 50* paint may have been as light as RAL7038 (FS36492) on occasions. It would surely have been somewhere close to RAL7001 (FS36375) on other vessels at other times since that was the RAL code cross-referenced to it. In the table above I have suggested RAL7038 as an "alternative *Hellgrau 50*" colour. I further suggest that the real *Hellgrau 50* paint used upon numerous Kriegsmarine vessels could have ranged anywhere between, and including, this RAL7038 code and the more traditional RAL7001.

This variation in colour is much greater than I had expected. Falk Pletscher astutely notes upon the variation in the colour of the *Hellgrau 50* paint that, "I am quite sure that the colour of the paint *Hellgrau 50* was not exactly defined. Otherwise it would have been taken into the RAL register."

If such was the case for *Hellgrau 50*, then we should not expect any less variation for any other Kriegsmarine paint. For this reason alone, modellers do not have to adhere exactly to RAL or FS codes. These codes are merely suggested as bases from which modellers and enthusiasts can gain an idea what general colour the standard paints were.

The two-tone grey U-boat colour scheme

Kriegsmarine U-boats were painted in two greys. The first grey was painted on the conning tower and the upper hull (above the waterline). The second darker anti-fouling grey was painted on the lower hull, below the waterline. The horizontal division between the two greys took place just below the free-flooding holes on the hull. Early pre-war boats had this division line slightly lower than was common during the war. Some pre-war original Type VII boats (also known as VIIAs) had the tops of their saddle tanks painted in the upper colour, but most Type VIIs had the whole of their saddle tanks painted in the lower anti-fouling colour. Contrary to many illustrations in numerous publications, there was no bootline/boot-topping (the dark grey horizontal stripe between lower and upper waterline) on U-boats; these were only applied to surface units. The steel horizontal surfaces at the extreme bow and stern were either painted in the upper lighter grey or black. The wooden deck was coated with a wood preservative, and shall be discussed later.



Above: The division between the lighter upper grey and the lower darker grey can clearly be seen on U 69. As was common practice, the whole of U 69's saddle tanks were painted in the lower anti-fouling colour.
Photo source: Westwood, David. *Anatomy Of A Ship: The Type VII U-Boat*. Conway Marine Press, 2003.

Lower hull colours

A number of side profiles, drawings and illustrations show U-boats with red lower hulls and black bootlines, and these have sparked countless debates within the modelling community. Many commentators maintain that no U-boats, either before or during the war, ever had red anti-fouling paint beneath the waterline. Another opinion is that at the very start of WWII some U-boats had red lower hulls, but at the next dry-docking they were painted dark grey. Other opinions hold that while some pre-war boats may have been red, all wartime boats were dark grey.

In the book *Die Deutschen Uboote Geheim 1939-1945* (German U-Boat Secrets 1939-1945) by Richard Lakowski (Brandenburgisches Verlagshaus, 1997), there are two editions of the building regulations form Nr. 31, which specifies the application of paints upon U-boats. These can be found at –

http://www.u-boot-archiv.de/dieboote/farben_maerz_1940.html
http://www.u-boot-archiv.de/dieboote/farben_juli_1944.html

The March 1940, November 1941 and July 1944 editions of this building regulation all state that the external sections of the lower hull were to be painted with two coats of anti-corrosion paint followed by one coat of the anti-fouling dark grey paint *Schiffsbodenfarbe III Grau* (DKM 23a, literally "ships bottom colour 3 grey"). This was called *Wasserlinienfarbe W.L. III Grau* (literally "water line colour W.L. 3 grey") in the first two editions, but as previously mentioned this was exactly the same

paint as *Schiffsbodenfarbe III Grau*. Finally, another coat of *Schiffsbodenfarbe III Grau* (DKM 23b) was to be applied. 23b was exactly the same paint as 23a; the letters were used to specify that two coats were to be applied. There is no mention anywhere in these regulations of *Dunkelblaugrau* (RAL 7026), which is included in the Snyder & Short paint chip cards and White Ensign Models' KM paint range (Colourcoats KM03).

The otherwise excellent *Type VII U-Boats* (Brockhampton Press, 1998) by Robert C. Stern includes erroneous information on hull colours which directly contradicts the painting regulations. It is stated by Stern that, "the underbody was supposed to have been painted with a red anti-fouling compound but seems just as often as not to have been covered with the dark grey waterline colour," and that, "the upper surfaces of the saddle tanks and the band on the boat's side between normal trim waterline and lightest trim waterline were painted dark grey." Both statements are unquestionably erroneous: the wartime regulations call for dark grey anti-fouling paint and no bootline. Given the quality of Stern's book, it is very surprising that he should have made these obvious errors.

The artists who produced the drawings of wartime U-boats with red hulls and bootlines may have been influenced by the standard Kriegsmarine surface unit colours of red-brown hull - *Schiffsbodenfarbe III Rot* (DKM 22a and 22b, RAL8013, Colourcoats KM04) - and dark grey (*Wasserlinienfarbe W.L. III Grau*) bootline. Some artists may also have known that dark grey was the real colour used on wartime U-boats, but preferred to opt for red. The red hull provides a much more visually stimulating drawing than the drab, featureless grey, and artistic license may well have negated historical accuracy. The Amati 1/72nd U 47 kit is a perfect example of this. The model shown on the box has a red hull, yet the instructions specify that dark grey should be used. I suspect that marketing considerations may have taken precedence over accuracy.

The wartime painting regulations are thankfully available to us, but the pre-war painting regulations are, unfortunately, not in common circulation. These pre-war regulations would likely have shed light on the question of whether red anti-fouling paint and dark grey bootlines were applied to pre-war boats at any stage. It is especially regrettable because in black and white photographs it is impossible to distinguish with any degree of certainty between a red and a dark grey hull.

Since the U-boat arm had been experimenting with the colours above the waterline in the years leading up to the commencement of hostilities, could it have been possible that they also experimented with the colours below the waterline? A comment by U 35 veteran Kurt Grosser suggests to me that colours other than dark grey were used in pre-war times. He maintains that when he reported aboard U 35 in April 1939 the lower hull of this U-boat was dark green. We should be extremely careful when dealing with veterans' memories of the colours used 60 to 65 years ago, but this comment is interesting in light of the fact that a green anti-fouling paint - *Schiffsbodenfarbe I Grün* (DKM 24a and 24b) - was mentioned in the 1944 painting regulations.

If some experimentation had taken place, and it appears that it did, then it may be impossible to disprove the possibility that some pre-war U-boats may have had red

hulls. Although there is no positive confirmation of pre-war red hulls, how can we be certain without having access to every edition of the pre-war painting regulations that they did not exist?

There is a colour photograph in existence showing Joachim Schepke holding a toy model of a pre-war U 29 with a thick bootline and red hull. I am certainly not suggesting that this constitutes evidence of the use of red anti-fouling paint or bootlines on lower hulls. The manufacturer of the toy model possibly assumed, just as some people do today, that the red anti-fouling paint in common use upon other vessels of the Kriegsmarine was used upon U-boats. I mention this because I find it amusing that the possible erroneous use of red on U-boat models may have started as early as 1940 or 1941!

Having studied a number of photos of wartime U-boats coming off the slips and in dry-dock, I have not to date seen any evidence of any bootlines on any of these wartime boats. While an appreciable bootline might be difficult to discern in some black and white photographs, I have seen enough good quality images of exposed wartime U-boat hulls to convince me that bootlines were not applied to wartime boats. Neither have I discerned a bootline on any of the photos I have seen of pre-war boats with their lower hulls exposed. Some of these photos are of an excellent quality, and a bootline would certainly be discerned if present on the hull observed. However, I have not seen enough pre-war photos showing exposed lower hulls to be certain that bootlines were not present on some pre-war U-boats.

Lastly, due the increasing strain which the Ubootwaffe was under, and the sheer number of U-boats produced, the possibility of the odd exception cannot be discounted. It is plausible to suggest that adherence to the painting regulations became of a much lesser priority, particularly towards the end of the war. In some cases, paints that were to hand must surely have been used rather than the paint specified in the regulations.

To conclude, I find that although there is no positive evidence of the use of red on pre-war hulls, the possibility cannot be completely discounted. But I would suggest that it would be prudent of modellers who choose a pre-war U-boat not to use red unless positive confirmation comes to light. If a wartime U-boat is being modelled I would recommend a colour somewhere in the region of *Schiffsbodenfarbe III Grau* (RAL 7016) for the lower hull.

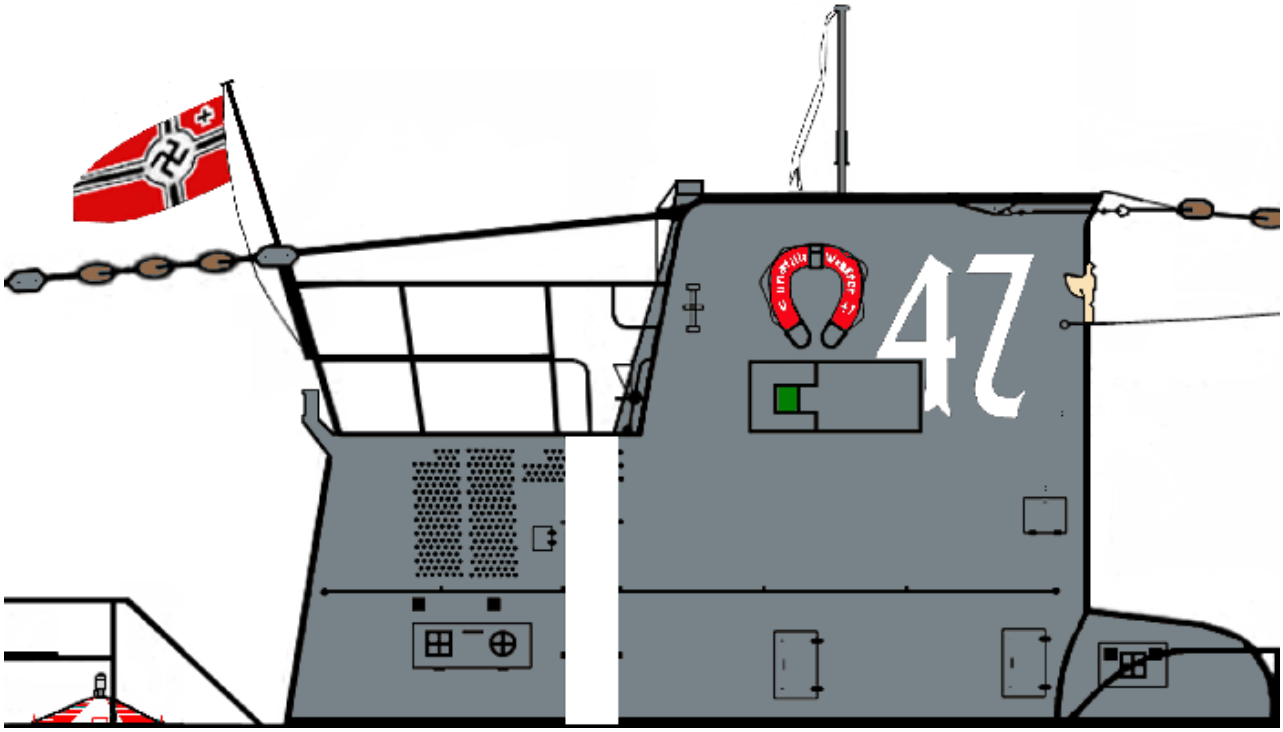
Pre-war colours

Pre-war U-boats had the following features –

- the U-boat number (without the U) was painted in large numerals approximately 1.5 metres tall on both sides of the conning tower. Any U-boat photographed without this number is therefore a wartime boat.
- a small oval plate inscribed with the U-boat's number (with the U) was located just under the small free-flooding holes near to the bow, on both sides of the hull.
- an unpainted bronze eagle plaque was located on the front face of the tower, just below the wind deflector.

- the raised detail of the circle and square markers, both of which had crosses within them, were sometimes painted black. In other case they remained grey, while sometimes the background of the marker (the four squares within the larger square and the four squares within the circle) was painted white. These markers indicated the location of compressed air connections, and were found on both port and starboard walls of the tower. The raised detail of the square marker with a cross within it on either side of the magnetic compass housing was painted similarly. These markers indicated the location of connections to fill air bottles.
- the emergency rescue buoy, two of which were in place on U-boat decks, were red and white. On Type VIIs, the first was located forward of the 20mm Flak gun and the second was just aft of the capstan. Some of these red and white buoys had three white strips which curved in a circular pattern around the outside. Black text appeared upon these strips; the topmost strip read “Unterseeboot” followed by the U-boat’s number.
- sometimes during the pre-war years the red horseshoe-shaped lifebelts would have the name of the U-boat’s flotilla and the U-boat’s number marked in large white letters and numerals.

Just prior to the start of the hostilities the first three features were all removed, and the circles and squares with the crosses within were painted the same grey as the conning tower. Most of the emergency rescue buoys were moved inside metal deck hatches so they would be less obstructive to the crews working on the deck. On the wartime U-boats which retained these buoys, they were painted black rather than red and white.



Above: The tower of the Type VIIB U 47 during her commissioning ceremony. Pre-war features include the large white number, the bronze eagle (to the right of the 7), the red horseshoe-shaped lifebelt with white lettering, the green starboard navigation

light, and the red and white emergency rescue buoy behind the tower. The white rectangle is not paint but a white board that was often used during commissioning ceremonies to protect the pristine paintwork from being smudged by the toes of sailors' dirty boots.

During the pre-war years it was common to see U-boats sporting different colours to others in the harbour, since different schemes were being tried at this time. It is possible to determine their colours because in pre-war times several U-boats were often photographed next to their tenders. The *Dunkelgrau 51* hulls and *Hellgrau 50* superstructures of the tenders provide reference points which allow comparisons to be made.

Above: Photos such as this one, in which the colour of the U-boats can be compared to the *Dunkelgrau 51* hull and *Hellgrau 50* superstructure of the tender, are valuable tools in determining U-boat colours. Two different colour schemes are evident upon these pre-war Type IIs. In the front row, four have *Dunkelgrau 51* upper hulls and *Dunkelgrau 51* towers, while three have *Dunkelgrau 51* upper hulls and white towers. Photo source: Rössler, Eberhard. *Vom Original zum Modell: Uboottyp II.* Bernard & Graefe Verlag, 1999.

Some of the earliest pre-war U-boat schemes included –

Dunkelgrau 51 upper hulls and *Dunkelgrau 51* towers, with the numbers on the tower in white.
Dunkelgrau 51 upper hulls and white towers, with the numbers on the tower in dark grey.
Dunkelgrau 52 upper hulls and white towers, with the numbers on the tower in dark grey (rare).
Hellgrau 50 upper hulls and *Hellgrau 50* towers, with the numbers on the tower in dark grey.

Later on a very dark grey colour that is likely to have been *Dunkelgrau 52* was used on the upper hulls and towers. Then, immediately prior to the war, the most

common scheme within the U-boat fleet consisted of *Dunkelgrau 51* on the upper hulls and towers. In both these latter two cases, the numbers on the conning towers were in white.

Above: The *Saltzwedel* Flotilla in Bremen during 1937. Once again different schemes are evident, and again the presence of the tender helps us with paint colours. Most of the boats are darker than the tender's *Dunkelgrau 51* hull; they may be in *Dunkelgrau 52*. U 33 is painted in alternative Spanish Civil War markings.
Photo source: http://www.u-35.com/ (courtesy of Hans Mair)
Note: A number of photos of U 35 in Spanish Civil War markings can be found on Hans Mair's website at http://www.u-35.com/

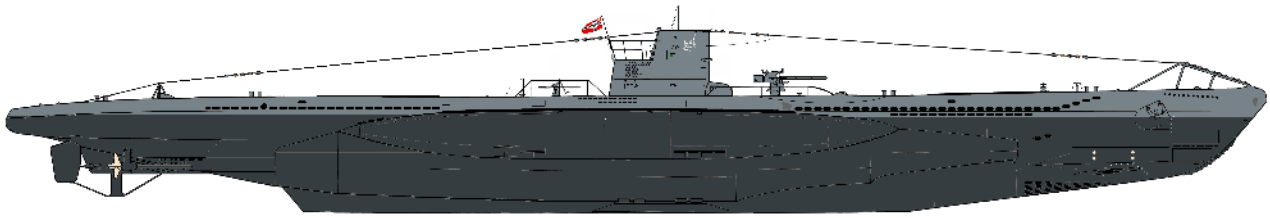
During the Spanish Civil War, fifteen U-boats – U 14, U 19, U 23 and U 25-U 36 – were deployed as part of the "Non-Interventionist Committee". This involvement lasted from November 1936 until May 1939. U-boats serving in this conflict had vertical stripes of black, white and red on both sides of their conning tower, as well as the front of their conning tower. They also had these black, white and red stripes on the fore and aft deckcasing, perpendicular to the deck. Sometimes a pattern other than stripes was used on the bows and conning towers. U 33 and U 34 engaged in clandestine patrolling in the Spanish Civil War in November and December 1936. Due to the secretive nature of their patrols, all identification markings were painted out on these U-boats during this period.

Wartime upper greys

Immediately prior to the war, the most common scheme within the U-boat fleet consisted of *Dunkelgrau 51* on the upper hulls and towers. Very soon after the start of hostilities the *Dunkelgrau 51* paint on a few U-boats such as U 30 was replaced by *Hellgrau 50*. Over the course of the winter of 1939, the *Hellgrau 50* paint gradually became as common as *Dunkelgrau 51*. Many of the U-boats which were completed in

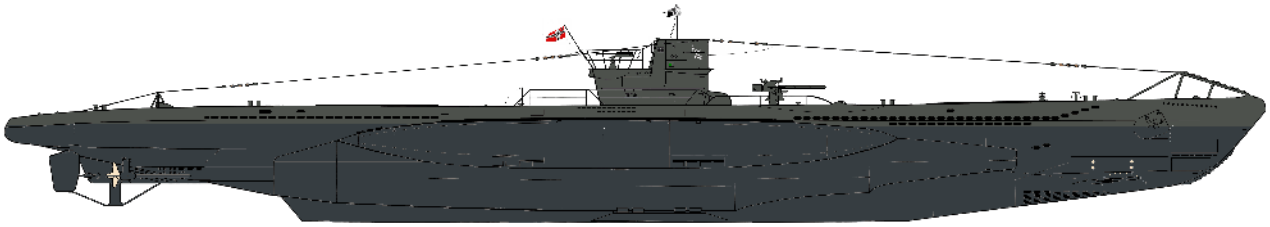
1940 (such as U 69, U 94, U 99 and U 552) sported this light grey *Hellgrau 50* colour during their commissioning ceremony.

The contention by some that most wartime U-boats were the light grey *Hellgrau 50* is wholly inaccurate, as both *Hellgrau 50* and *Dunkelgrau 51* were commonly used upon wartime U-boats. The common use of both these colours is supported by the well-researched 3-part decal sheet by U.L.A.D.-decal for the Revell 1/72nd Type VIIC U-boat kit.



Above: An early Type VIIB U-boat with *Dunkelgrau 51* (RAL7000) as the upper colour and the standard *Schiffsbodenfarbe III Grau* (RAL 7016) on the lower hull.

Another colour which was used was *Schlickgrau 58. Blaugrau 58/1* and *Dunkelgrau 52* were much less common, and *Blauschwarz 58/2* was hardly used at all. According to Randy Short of Snyder & Short Enterprises, *Blauschwarz 58/2* was not used at all upon Type VIIs. *Dunkelgrau 53* was used in camouflage patterns, but was rarely (if at all) used as a sole upper colour.



Above: A later Type VIIB U-boat with *Schlickgrau 58* as the upper colour and the standard *Schiffsbodenfarbe III Grau* (RAL 7016) on the lower hull.

It would have been somewhat helpful if the painting regulations had stated which of the Kriegsmarine paints were to have been used upon the upper hulls and conning towers of U-boats. Unfortunately they don't, and so are of limited use to us. The painting regulations stated only that shipyards had to ask the High Command for instructions on painting the upper colour of **each individual boat**, and that the U-boat's planned operational area would often influence the shade of grey used. The latter does help us with the boats which served in the Arctic and in the Mediterranean, and shall be discussed shortly.

The regulations offer absolutely no help to us on the question of which of the three most common colours - *Hellgrau 50*, *Dunkelgrau 51* or *Schlickgrau 58* - was used on boats serving in the Atlantic or training in the Baltic. All we can do is attempt the difficult and often frustrating task of photographic interpretation. It is very difficult to differentiate between *Hellgrau 50* and *Dunkelgrau 51* in black and white photos where no reference point is available. In general terms, the *Hellgrau 50*

paint looks very light – even white – in photos where the sun is shining upon the surface in question. *Dunkelgrau 51* can look light when there was a lot of light present in the photograph, but does not ever look white like the *Hellgrau 50* sometimes does. For modellers attempting to determine whether their chosen subject was *Hellgrau 50* or *Dunkelgrau 51*, it is advisable to study photographs of warships where these colours are known to have been used (as previously mentioned the superstructures of pre-war and early wartime vessels were *Hellgrau 50* and the upper hulls were *Dunkelgrau 51*). Although a marked contrast between these colours can be seen in photos of Kriegsmarine warships, it is still very difficult – sometimes impossible – to distinguish whether one or the other was used on a U-boat merely by photographic interpretation. Such an exercise is often extremely frustrating and highly subjective.

It has already been mentioned that the painting regulations stated that shipyards had to ask the High Command for instructions on painting the upper colour of each individual boat. Since some U-boats served in different locations during their career, some sported different colours at various times. It is quite likely that the commanders and the bosses at the shipyards would also have had an influence over which upper colours were used. Such individuality between boats can be illustrated with U 47 and U 99. Both these famous U-boats served in the Atlantic, were based at Lorient toward the end of their careers, and were sunk in March 1941. The upper colour of U 47 was *Dunkelgrau 51* until the summer of 1940, when it was changed to a darker shade that may have been *Schlickgrau 58*. U 99, on the other hand, was *Hellgrau 50* throughout its illustrious career. This was perhaps because at the time U 47 was launched *Dunkelgrau 51* was the prominent colour, and when U 99 was launched it was more usual for *Hellgrau 50* to be used.

In the case of the U-boats serving in the Mediterranean, the theatre of operations did make a difference since it was commonplace for camouflage to have been used in that area. The same can be said for the Arctic, where conning towers were sometimes painted white. U-boats operating out of Norway frequently had the upper half of the conning tower, above the spray deflector, or all of their conning tower, painted white. This was intended to allow the boat to blend in better with the sea mists and fogs that often hang close to the surface of the water in high latitudes.

An order was placed by the High Command on the 7th May 1943 to the effect 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 the U-boats. Presumably these paints did not reduce the infra-red signature of a U-boat. Instead, the High Command, who were alarmed at the number of U-boats being sunk at that time by aircraft, must have deemed that these darker colours would render a U-boat less visible to enemy aircraft. This order seems not to have been adhered to, as the light and medium greys were still used until the war's end.

Early in the war standard colours had been commonly used within the U-boat fleet. However, as the war progressed non-standard greys were being used due to the wartime shortages. By the end of the war, darker colours were more common than

had been the case at the start of the conflict. The colour photographs of U 505, U 805 and U 858 all show medium blue-grey (probably *Dunkelgrau 51*) upper hulls and very dark blue conning towers (possibly *Blauschwarz 58/2*?)

Conning towers and upper hulls were sometimes different colours, especially later in the war. Such was the case on U 995, which at some point in its career had a medium-to-dark upper hull and a white or *Hellgrau 50* tower, and U 162, which had a *Dunkelgrau 51* upper hull and a *Hellgrau 50* tower. In rarer cases such as U 302 in the summer of 1942, the upper and lower halves of the conning tower were different colours.

The following U-boats may have had these upper colours. The colours are merely educated guesses, and can in no way be guaranteed –

U 30	Pre-war	*Dunkelgrau 51*
	November 1939	*Hellgrau 50*
	1942 (training flotilla)	*Schlickgrau 58*
U 35	3rd November 1936 (com.)	*Hellgrau 50*
	1937	*Dunkelgrau 52*
	5th February 1938	*Dunkelgrau 51* + Spanish Civil War stripes
	17th June 1938 – October 1939	*Dunkelgrau 51*
U 37	Pre-war	*Dunkelgrau 51*
	1942 (training flotilla)	*Dunkelgrau 52* or *Dunkelgrau 53*
U 47	December 1938 – July 1940	*Dunkelgrau 51*
	August 1940 – March 1941	*Schlickgrau 58*
U 48	September 1939	*Dunkelgrau 51*
U 69	19th September 1940 (launch)	*Hellgrau 50*
U 73	April 1941	*Dunkelgrau 51*
U 86	Summer 1942	*Dunkelgrau 51*
U 94	12th June 1940 (launch)	*Hellgrau 50*
	18th April 1941	*Hellgrau 50*
	1942	*Dunkelgrau 51*
U 95	24th February 1941	*Schlickgrau 58*
U 99	Throughout career	*Hellgrau 50*
U 128	May 1941 (UAK trials)	*Hellgrau 50*
U 162	August 1942	*Dunkelgrau 51* upper hull and *Hellgrau 50* tower
U 163	April/May 1942	*Dunkelgrau 51*
U 203	4th January 1941 (com.)	*Dunkelgrau 51*
U 267	April 1943	*Dunkelgrau 51*
U 302	Summer 1942 (training)	*Dunkelgrau 51* upper hull; *Dunkelgrau 51* on lower half of tower; *Schlickgrau 58* on upper section with yellow training band
	September 1943	*Hellgrau 50*
U 335	April/May 1942	*Dunkelgrau 51*

U 362	30th July 1944	*Weiß 30* upper hull and lower half of tower; upper half of tower dark grey
	End of 1944	*Weiß 30*
U 405	April 1943	*Hellgrau 50*
U 438	May 1943 (sinking)	*Schlickgrau 58*
U 441	21st February 1942 (com.)	*Hellgrau 50*
	Summer 1942 (5th U-Flottille)	*Hellgrau 50* upper hull and *Dunkelgrau 51* tower
U 442	12th January 1942 (launching)	*Hellgrau 50*
U 505	4th June 1944 (capture)	*Dunkelgrau 51* upper hull and *Blauschwarz 58/2* (?) tower
U 552	Throughout operational career	*Hellgrau 50*
U 558	June 1942	*Dunkelgrau 51*
U 564	11th July 1942	*Dunkelgrau 51*
U 673	Flak-trap	*Schlickgrau 58* (?)
U 751	Late 1941	*Hellgrau 50*
U 805	14th May 1945 (after capture)	*Dunkelgrau 51* upper hull and *Blauschwarz 58/2* (?) tower

It is essential to recognise that these boats were not necessarily these colours throughout their careers.

Above: The U-boats seen here in Gotenhafen have rusty protective caps over their bows to prevent damage from ice. The decks are covered under a layer of snow. The IX second from the left, U 37, looks particularly dark.
Photo source: Jung, Dieter, Abendroth, Arno and Kelling, Norbert. *Anstriche und Tarnanstriche der deutschen Kriegsmarine* (Painting and Camouflage of the German Navy). Bernard & Graefe Verlag, 1997.

Camouflage patterns

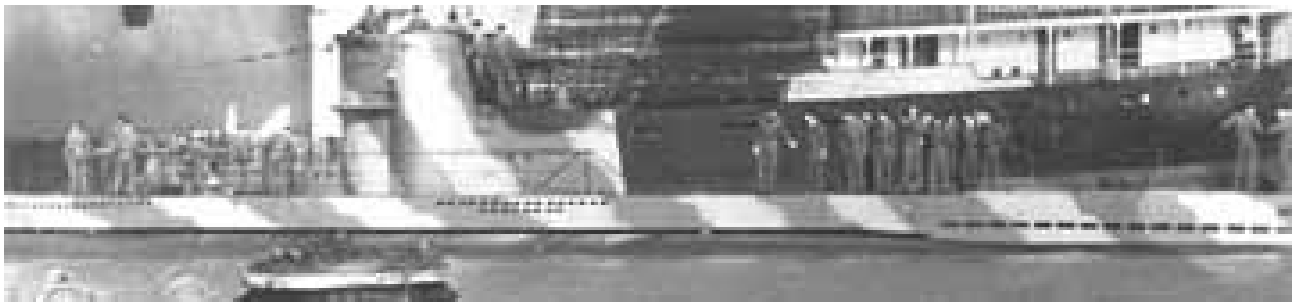
Camouflage schemes were applied to a number of U-boats. Though it was not common, camouflage had been used in the U-boat fleet before the outbreak of war (U 25, U 33 and U 40 are three such examples). Though the use of camouflage gradually diminished during 1943, when U-boats were forced to spend most of a patrol submerged, a few still sported schemes in 1944.

Often this camouflage would consist of dark grey stripes, bands, patches, lines or jagged splotches over a lighter grey. Sometimes the camouflage would extend over the whole of the upper hull and conning tower, whereas in other cases the camouflage was limited to the conning tower only. Though feathered edges were used in the sprayed-on wavy striped camouflage schemes, it was much more usual for hard edges and straight lines to be used. Below is a list of the assorted styles of camouflage schemes that were seen upon U-boats of differing types. All schemes, other than those specified, had hard edges.

U 9	May 1943	Middle section of hull plus lower area of tower dark grey; other areas light grey; edges feathered
U 25	Late 1939	Zig-zags on tower, plus shark's mouth
U 40	September 1939	Splinter scheme of small triangles on tower
U 81	13th Nov. 1941 (sinking of HMS *Ark Royal*)	Squiggly lines on upper hull; two dark areas with jagged lines at top on port side of tower; weird shape on starboard side of tower
	28th July 1943	Triangle on tower, triangular-shaped lines (plus one round shape near bow) on hull
U 82	Late 1941	22 wavy feather-edged stripes on port side; 23 on starboard side
U 83	February 1942	Mediterranean jagged splotches over tower and upper hull
U 119	Early 1943	False silhouette deceptive camouflage
U 123	Sometime in 1941	Assorted jagged shapes on tower, none on hull
	June 23rd 1941	Wavy stripes sprayed on with very feathered edges
	Christmas 1941	No camouflage
U 141	Sometime in 1941	8 straight feather-edged stripes on starboard side and tower; unknown number on port side
U 160	19th April 1943	One line on tower, irregular shapes on upper hull
U 183	Summer 1944	Three wide bands per side, plus one on either side of tower
U 201	8th June 1941	14 wavy feather-edged stripes on port side; 13 on starboard side
	21st May 1942	Similar but not identical to June 1941 pattern
U 204	Spring 1941	Diamond on either side of tower, plus V at front of tower; some areas of upper hull also camouflaged
U 253	April/May 1942	3 irregular-shaped areas with sharp edges in RAL7016
U 453	1943 or 1944	Inverted V on tower with patches on upper hull
U 556	30th May 1941	5 slightly wavy, feather-edged stripes of variable

		width on starboard side; unknown number on port side
U 561	5th Sept. 1942	Wide dark band on tower
U 596	1942 or 1943	Mediterranean jagged splotches over tower and upper hull
U 711	30th July 1944	One thin, very dark wavy line on tower, plus two similar lines on upper hull, over white or light grey

Above: U 253 in 1942, with a distinctive camouflage scheme. The RAL7016 used upon the lower hull was extended over some areas of the upper hull and conning tower of U 253. The light grey looks like *Hellgrau 50*.
Photo source: Jung, Dieter, Abendroth, Arno and Kelling, Norbert. *Anstriche und Tarnanstriche der deutschen Kriegsmarine* (Painting and Camouflage of the German Navy). Bernard & Graefe Verlag, 1997.



Above: Due to the aesthetic camouflage scheme employed upon U 201 (seen here in Brest in 1941), the boat is a popular choice for modelmakers. Darker grey wavy stripes were sprayed on over a lighter grey on a few Atlantic-based U-boats. The number of stripes varied from boat to boat. Note that the darker grey was still lighter than the dark grey anti-fouling *Schiffsbodenfarbe III Grau* on the lower hull.
Photo source: Dallies-Labourdette, Jean-Philippe. *U-Boote 1935-1945 The History Of The Kriegsmarine U-Boats*. Histoire & Collections, 1996.

Standard camouflage schemes could be found in some theatres of operations. The schemes found on some Atlantic U-boats were often dazzle-type schemes, which used wide stripes to disrupt visual rangefinding. A few Atlantic boats sported the attractive wavy striped camouflage scheme. The Type IIs serving in the Black Sea often had the lower half of their conning towers, and a middle section of their upper

hull, painted in a dark grey. The edges on this scheme were sometimes feathered, and sometimes hard-edged.

In the Mediterranean, the theatre where camouflage was most commonly found, a pattern of dark grey jagged splotches applied at regular intervals over the upper hull and conning tower was commonly used. Sometimes, as on U 453, there were patches with hard edges rather than jagged splotches. As the waters of the Mediterranean are much clearer than the Atlantic, U-boats could be seen from the air at a greater depth. A U-boat at periscope depth could be clearly seen from the air in daylight, so the pattern of dark splotches or patches was intended to break up the U-boat's shape sufficiently to prevent detection from the air.

Above: An example of the dark splotches with jagged edges that were added to the upper hull and the conning towers of a number of boats serving in the Mediterranean. Photo source: Trojca, Waldemar. *Ubootwaffe 1939-1945 Cz.2* (*Encyklopedia Okretow Wojennych* Number 11). AJ-Press, 1998.

False bow and stern deceptive camouflage was used on several Kriegsmarine battleships. The "Baltic scheme" included a false bow and stern wave painted in white, and the dark grey *Dunkelgrau 52* on the hull at the bow and the stern. The latter was intended to fool the enemy into thinking that a vessel was shorted than it actually was. Such was the intention of the deceptive camouflage on the large Type XB U-boat U 119. A false silhouette was painted in dark grey upon the *Hellgrau 50* hull.

Camouflage colours

It is exceptionally difficult to tell what colour was sprayed on over the light grey *Hellgrau 50* or medium blue-grey *Dunkelgrau 51* in the wavy striped camouflage schemes. The three most likely candidates would be *Schlickgrau 58*, *Dunkelgrau 52* and *Dunkelgrau 53*. The 3-part decal sheet by U.L.A.D.-decal for the Revell 1/72nd Type VIIC U-boat kit suggests *Dunkelgrau 52* for U 201 and *Dunkelgrau 53* for U 82. However, on both these boats there is quite a contrast between the lower anti-fouling dark grey and the darker camouflage grey. This suggests to me that *Schlickgrau 58* (which was lighter than *Dunkelgrau 52*) was used on these boats. As

Schlickgrau 58 was slightly greenish, this accords with some reports (unfortunately of unknown origin) which state that green was used in U-boat camouflage schemes.

Sometimes the dark grey RAL7016 was extended up over areas of the hull and the tower, as was the case on U 81, U 253 and the Type IXC U 163. The question of whether this was the anti-fouling *Schiffsbodenfarbe III Grau* or *Dunkelgrau 53* is irrelevant for modellers as both were RAL7016.

On several of the photos I have seen of Mediterranean-based U-boats, the dark splotches look the same colour as the lower hull, RAL7016. But according to Robert C. Stern in *U-Boats In Action* (Squadron/Signal Publications, 1977), Italian blue-grey (*Blu Scuro*, Colourcoats RM03, FS35109) was used over the Kriegsmarine light grey (*Hellgrau 50*) on boats serving in the Mediterranean theatre. Not knowing Stern's source, I am unable to confirm or deny this assertion. But as some of his comments on paint colours are inaccurate, I am not convinced that we can rely upon this contention to be accurate. I do acknowledge, though, that the use of a blue paint within a Mediterranean setting does make a lot of sense.

Insignia & tonnage markings

Many U-boats had insignia (*bootswappen*) painted on their conning towers. These insignia are often referred to as emblems. It appears that the first insignia was a metal Iron Cross mounted on the conning tower of U 9 during the pre-war period. This was applied to carry on the tradition of the famous U 9 of the First World War. As this was a plaque, it remained visible when it was over-painted at the start of the war. The first insignia to be painted on a U-boat conning tower was applied to U 30 on the 10th September 1939. It was a painting of a fox terrier called *Schnurzl*, who had often been on board during pre-war times.

Despite orders from the High Command for these insignia to be removed, no real effort was made to end this practice. As they had a morale-boosting effect for the crews, they became universally tolerated by the High Command. The insignia differentiated a boat from others in the U-boat fleet, so allowing the crews to have identification with their U-boats. Many crews even had metal insignias made, which they attached to their caps or uniform jackets. The use of these insignias was so widespread that boats without one were considered odd.

The insignias were inspired by a variety of sources. These included –

- Personal references to the commander. Examples include the "Snorting Bull", which depicted the character of U 47's commander, Günther Prien, and the snowman insignia of U 201's commander, Adalbert Schnee (*schnee* means "snow" in German).
- Civic heraldry. Many German towns and cities sponsored U-boats, contributing money towards their construction. This scheme was called *patenschaft*. These boats often had the town's crest painted, or mounted on a plaque, on the tower. U 201 had the crest of Remscheid on its tower, which indicated that it was sponsored by that city. Most of the boats in the series of

twelve boats following U 201 were sponsored by cities. Often other personal insignia were applied in addition to these crests.

- Class symbols. A commander who had graduated from the Kriegsmarine's Naval Academy would often choose insignia representing the graduating class. The Olympic Rings on U 20 and U 23 indicated that the commander of the boat had graduated in 1936. This was in reference to the Olympic Games held in Germany in 1936.
- Drawings mocking the enemy. U 34 had an elephant stomping on Churchill's head and U 94 had a little animal taming a British bulldog.
- Patriotic imagery. Only in rare cases would swastikas be used as part of the insignia (U 123 and U 132).
- Good luck signs. U 99 actually had horseshoes welded onto both sides of the tower. U 48 had the opposite of having a good luck insignia – a black cat with "X3", meaning "three times" - below.
- German folklore.

Some of the more famous insignia, or those belonging to the most famous boats and/or commanders, are as follows -

U 9	Black Iron Cross with a crown, W and 1914 in white
U 19	Rat with umbrella riding on torpedo
U 23	Olympic rings denoting Naval Academy class 1936
U 30	Fox terrier called *Schnurzl*
U 34	Elephant stomping on Churchill's head
U 46	White outline of snorting bull (U 46's commander Engelbert Endrass had designed this insignia when serving as IWO on U 47)
U 47	White outline of snorting bull (the Bull of Scapa Flow, became 7th U-Flottille insignia)
U 48	Black cat with 3X below
U 57	Red devil (Erich Topp)
U 69	Laughing cow with "La Vache Qui Rit" / Horridoh
U 82	Crest of Coburg – a sword on a shield divided into black and gold halves
U 83	Viking ship
U 94	Green creature tugging at roaring British bulldog
U 96	Laughing swordfish, created after 3rd patrol (became 9th U-Flottille insignia when U 96's commander Heinrich Lehmann-Willenbrock took over the flotilla)
U 99	Real bronze horseshoes welded onto either side of tower
U 100	Large panther
U 107	Four playing cards
U 110	Fox terrier called *Schnurzl* (Fritz-Julius Lemp had commanded U 30)
U 123	German helmet with swastika / kettledrum
U 124	Edelweiss
U 141	Devil riding on torpedo
U 183	Japanese rising sun flag and Kriegsmarine flag

U 201	Snowman (Schnee) / Crest of Remscheid (sponsoring city)
U 203	Red turtle / Crest of Essen (sponsoring city)
U 253	Blowing man
U 333	Three white fishes
U 377	Laughing swordfish (9th U-Flottille insignia)
U 404	Large stylised Viking ship prow (became basis of 6th U-Flottille and 23rd U-Flottille)
U 441	Ladybird
U 505	Scallop shell
U 552	Red devil (Erich Topp had commanded U 57)
U 556	Parzival towing battleship *Bismarck* which it "sponsored"
U 564	Black cat with 3X below (U 564's commander Reinhard Suhren had served as IWO on U 48)
U 995	Two figures from Fang den Hut game

One of the most famous insignia was the white outline of a snorting bull, which had been painted on U 47's tower upon returning to Germany from its successful Scapa Flow mission. Following this, other U-boats belonging to the 7th U-Flottille (of which U 47 was a member) began to sport the snorting bull insignia. This identification symbol received an official sanction, and from April 1941 onwards U-boats of the 7th U-Flottille were requested to paint *Der Stier von Scapa Flow* – "The Bull Of Scapa Flow" – on their towers. Later stencils were produced to aid the application of the bulls.

Many of the U-boat flotillas developed their own insignias. Often a U-boat's tower displayed both a personal insignia and a flotilla insignia. U 552, for example, had a red devil personal insignia next to the snorting bull insignia of the 7th U-Flottille.

If a U-boat survived until it was relegated to training duties, the insignia would often remain in place. Sometimes this would be seen next to tactical markings. However, the flotilla insignia would be removed, since the U-boat was being transferred from an operational flotilla to a training flotilla.

Sometimes insignia would be transferred from one boat to another. Reinhard Suhren spent a year as First Watch Officer aboard U 48, which had a black cat with "3X" below as its insignia. In April 1941 he took command of U 564, and used the same insignia on this U-boat. When Heinrich Lehmann-Willenbrock left U 96 to become the commander of the 9th U-Flottille, U 96's laughing swordfish insignia became the insignia of the 9th U-Flottille.

The colour of U 96's laughing swordfish is difficult to determine. Red, blue, green and black have all been cited as possible, with white painted around the border. The metal swordfish pennant which was sometimes attached to the top of the commander's flagstaff of U 96 when the U-boat was in port is still in existence, having belonged to Heinrich Lehmann-Willenbrock until his death in 1982. This metal pennant is a lime green colour, and can be viewed at http://indigo.ie/~pauldar/page11.html. As it would not make sense for the painted insignia and the metal pennant to have been different colours, then the swordfish

painted on U 96's tower may also have been a lime green colour. This assumes, of course, that the pennant is still the same colour as it was in 1942. Since this is a very large assumption I offer this information as a matter of interest rather than proof.

The numerous laughing swordfishes used as 9th U-Flottille insignia may not necessarily have been the same colour as U 96's swordfish, and there may have been variations in colour between these swordfishes. The colour guide in Georg Högel's comprehensive book on insignia indicates blue as the colour of the 9th U-Flottille insignia. Also included in this book is a Canadian report stating that U 659's swordfish was blue.

When conning towers were repainted the insignia were often slightly altered. U 47's snorting bull, for example, was altered at least six times during the 18-month period when it appeared on U 47's tower. Not only were some insignia designs improved, but on occasions they were replaced by completely new insignia. A change of commander was often the reason why a change of insignia occurred. When U 566 was commanded by Dietrich Borchert, a polar bear (due to U 566 being the first U-boat in the Arctic Ocean) and the crest of Lindau were present. Later, in 1943, when Hans Hornkohl was in command, U 566 had the head of a suckling she-wolf painted on the conning tower rather than the polar bear.

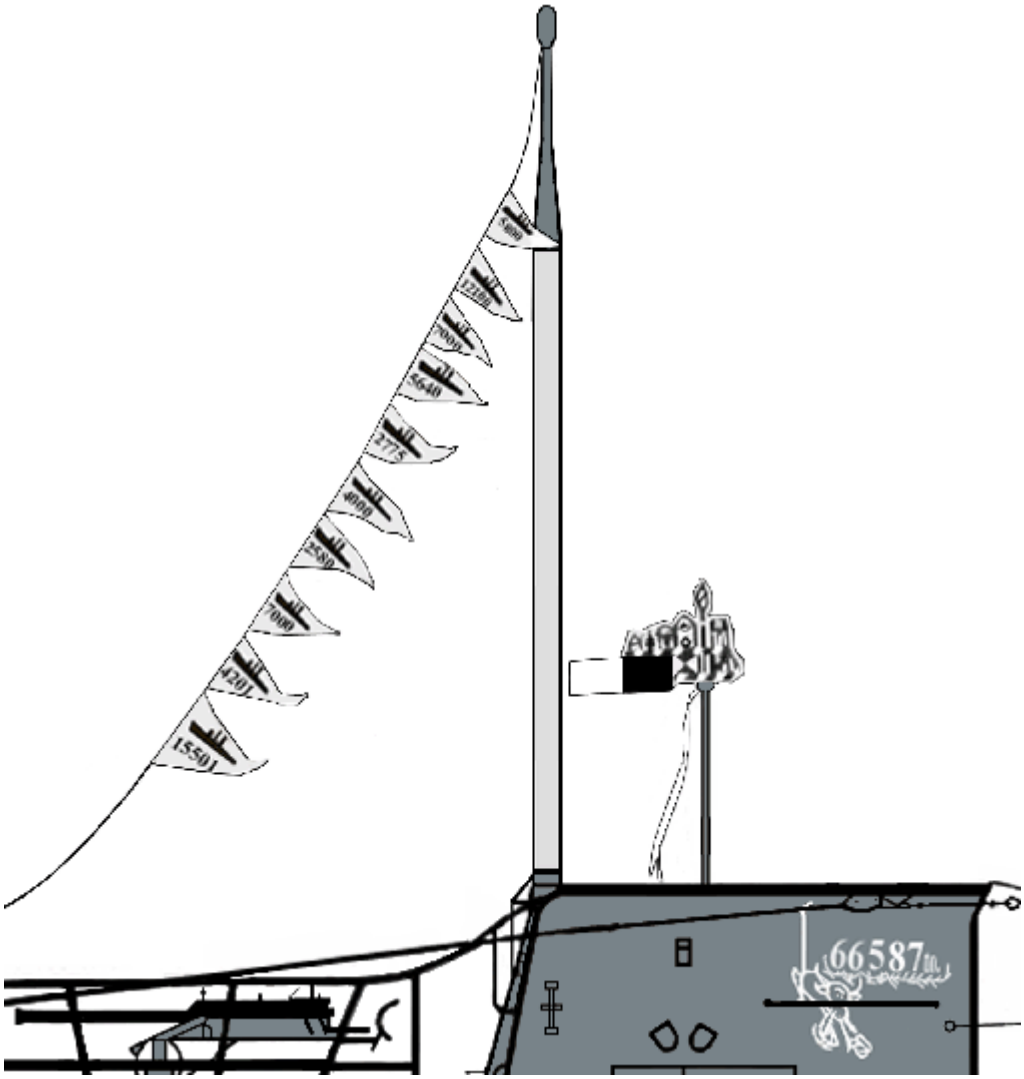
Crews took great pride in awards received by their commanders. When U 48's commander received the Knight's Cross, a cross was added around the black cat's neck. Oak leaves were sometimes painted upon conning towers to celebrate that the commander had been awarded the Oakleaves to his Knight's Cross. This was taken one step further by the crew of U 201. When Adalbert Schnee was awarded the Oakleaves to his Knight's Cross, the crew celebrated his award by placing real oak leaves around the conning tower bulwark. (The placement of flowers and greenery on the conning tower bulwark or the railings behind was a traditional part of the greetings ceremony for a returning boat)

The total amount of tonnage sunk during a patrol or during a U-boat's career so far was often painted on the tower during the early years of the war. Slogans were another feature that were sometimes added to the tower. At one stage early in its wartime career, U 48 has the names of the ships it had sunk pasted on its conning tower. Other examples include the motto *On les aura* – "we'll get them" – on U 204 and messages painted on the tower of U 201.

The practice of displaying victory pennant flags (*erfolgswimpeln*) when entering port after a patrol was extremely commonplace. Crewmen would often paint the tonnage of a vessel they had sunk during that patrol upon a white pennant. Each pennant would denote a ship sunk, and they would be hung in a line from the attack periscope to the tower railings behind. White signified a merchant ship, and red signified a warship. Usually the number of flags indicated how many ships had been sunk during the patrol, but sometimes a flag was flown for each ship sunk during the boat's career. This practice originated from the First World War, when on one occasion 23 pennants were hung from Lothar Von Arnauld De La Periere's U 35, which had sunk 23 vessels on a five-week mission. U 177 celebrated their victories with a cane inscribed with rings indicating each vessel sunk. Another celebratory feature that was sometimes displayed on U-boat towers was the hanging of trophies.

For example, the lifering of a sunken vessel was hung upon U 124's tower at one stage.

Lastly, pennants were sometimes attached to the commander's flagstaff. U 203's pennant had "MUBU" below the crest of Essen, the sponsoring city of U 203. The four letters were derived from the commander's surname, Mützelburg.



Above: The upper half of U 47's tower upon returning to Kiel from her successful sixth patrol on the 6th July 1940. On that day, ten victory pennant flags (*erfolgswimpeln*) were flown from the raised attack periscope. The figures on each flag denote the estimated tonnage of the vessel the crew had sunk, or believed to have sunk. The total the crew estimated they had sunk during the patrol (66587 to.) appears to the right of the snorting bull, with leaves below. Overestimation of tonnage sunk was commonplace, and post-war analysis has often reduced the tonnage figures. At the top of the commander's flagstaff is the boat's Pillkoppen pennant, which often featured there during the latter half of the boat's career.

Tactical markings

U-boats that were involved in training had yellow (*Deckfarbe Gelb*, RAL1003) identification bands around the conning tower (just above the spray deflector) and across the deck. In some cases red (*Deckfarbe Kaiserrot I* (RAL 3010) or *Deckfarbe Rot* (RAL 3011)) was used rather than yellow. U-boats that belonged to training flotillas each had an individual marking which would identify them from another boat.

Above: The yellow band above U 749's spray defector and the other band on the foredeck, just behind the capstan, indicate that the boat was involved in training. Not visible in this image is the other yellow band that would have been present on the aft deck.
Photo source: Wetzel, Eckard. *U 995: Das U-Boot vor dem Marine-Ehrenmal in Laboe*. Karl Müller Verlag.

Around 1940, U-boats began to have tactical markings applied to both sides of their conning towers during their trials at the *Ubootabnahmekommando* – UAK – (U-boat Acceptance Command). These were unnecessary during the pre-war period because the U-boat's number had been painted on both sides of the tower. Tactical marks for Type VIIs originally consisted of four symbols – a circle, square, triangle or two small triangles; they were white if the boat had been built by *Friedrich Krupp Germaniawerft* or black if it had been built by *Deutsche Werke*. As more shipyards were drawn into U-boat construction a variety of bars were added to distinguish U-boats built by different yards. Type IX U-boats used diamonds, hearts, clubs or spades as a means of identification, and the small coastal Type IIs used another totally different set of symbols. The same symbols were re-used by a number of U-boats. Colours included black, white and red.

Above: U 302 in the Baltic during the late summer of 1942. The yellow band indicates that the boat was assigned to training at this time. The white triangles and lines on the tower are UAK tactical markings. Note that the grey above the yellow band is darker than the grey on the lower half of the tower and hull sides.
Photo source: Jung, Dieter, Abendroth, Arno and Kelling, Norbert. *Anstriche und Tarnanstriche der deutschen Kriegsmarine* (Painting and Camouflage of the German Navy). Bernard & Graefe Verlag, 1997.

Many men disliked the presence of the tactical identification marks as they distinguished a U-boat as a training boat that had seen no action. These signs would be happily and swiftly removed by the crew upon completion of training. At that point, a small *Frontrief* - "ready for the front" – symbol, with a red V underneath, was added to the conning tower to signify that the U-boat had completed the *Agru-Front* training programme (The name *Agru-Front* derived from *Ausbildungsgruppe für Frontunterseeboote* (operational training for boats going to the front)). The practice of applying the *Frontrief* was common, but not universal.

The following book includes a large number of personal and flotilla insignia, UAK and training symbols, and other drawings associated with the U-boat fleet –

Högel, Georg. *U-Boat Emblems Of World War II 1939-1945.* Schiffer Military History, 1999.
N.B. This book is an English translation of Högel, Georg. *Embleme Wappen Malings Deutscher U-Boote 1939-1945*. Koehlers Verlagsgesellschaft mbH.

Miscellaneous colours

The colours of the following parts are suggestions only. Given that there were so many U-boats and that different metals were used at various times, it is not possible to state that certain parts were always one particular colour.

Conning tower

Horizontal surfaces – The horizontal surfaces such as the spray deflector and the upper half of the fairing in front of the conning tower (which housed the magnetic compass) were sometimes painted black or dark grey (regulations state black) for camouflage purposes. On rarer occasions the wind deflector was also painted black or dark grey. The dark grey, on occasions, may have been *Dunkelgrau 53* (RAL7016), as it was common practice to paint the horizontal metal surfaces of Kriegsmarine warships with this paint (see Lfd. Nr. 31 and 31a in the July 1944 painting regulations). It could also be possible that the anti-fouling paint *Schiffsbodenfarbe III Grau* (RAL7016) was sometimes used.

Above: This photos shows, from left to right, U 362, U 711, U 278 and U 997, on the 30th July 1944. On the two middle boats, the upper half of the fairing in front of the conning tower (which housed the magnetic compass) is black or dark grey.
Photo source: Wetzel, Eckard. *U 995: Das U-Boot vor dem Marine-Ehrenmal in Laboe*. Karl Müller Verlag.

Wooden tower floor – The floor area behind the UZO was wood, and coated with black wood preservative. The area of the floor which was ahead of the UZO was metal, and painted black or dark grey.
Wooden slats – The vertical wooden slats on the inside of the conning tower bulwark prevented the crewmembers from sticking to the bulwark metal in freezing temperatures. These were coated with the black wood preservative used on the wooden decking. Wooden slats were often also fitted to the periscope supports and UZO column.
Inside of bulwark – The inside walls of the tower bulwark were usually the same grey as the outside of the conning tower. However, in rarer cases (such as on U 552 at some point in its career) the inside walls were painted black or dark grey.

Vertical stripe behind rungs – A rectangular area surrounding the area behind the rungs on the tower sides was very often painted black or dark grey on training boats. This practice may have been in place because the toes of the sailors' dirty boots would smudge the grey paint when climbing up and down the rungs. On U 751 this area was silver in colour. This practice was less common on frontline boats, perhaps because the dark stripe would be visible against the lighter grey background of the tower.

Above: U 405(left) and U 267(right) in St. Nazaire in April 1943. On the tower of U 267, the rectangular area behind the tower rungs is dark. The thin dark stripe between the tower and deck of U 267 is also evident. Other interesting features are the brown insulators on the aft jumping wires of U 405.
Photo source: Wetzel, Eckard. *U 995: Das U-Boot vor dem Marine-Ehrenmal in Laboe*. Karl Müller Verlag.

Conning tower base - A thin black or dark grey strip was painted around the base of U-boat conning towers.

Above: School boats of the 21st U-Flottille in Pillau in 1943. The thin black stripe around the base of the conning towers of these *Dunkelgrau 51* Type IIs is evident. The stripe on the left boat – possibly U 61 - is thinner than on the right boat.
Photo source: Wetzel, Eckard. *U 995: Das U-Boot vor dem Marine-Ehrenmal in Laboe*. Karl Müller Verlag.

Lifebelt – This red horseshoe-shaped lifebelt was held in place by a bracket on the outside of the tower bulwark. Front boats on patrol did not carry this lifebelt - only when a U-boat was manoeuvring in port would this be seen on the tower. Often U-boats did not sport these lifebelts even when in port.
Starboard navigation light – Clear green.
Port navigation light – Clear red.
Rear navigation light on tower – Clear white. On frontline U-boats the lenses and bulbs were removed.
Tower railings – Usually painted the same grey as the conning tower. However, in some cases (such as on U 552 at some point in its career) the tower railings were painted black or dark grey.
Tower railing seats – These seats were made of wood and usually coated with the wood preservative. The inside edges of the seats were prone to wearing away and revealing the wood underneath.
Insulated conduits for aft antenna wires – Located at the rear of many VIIC towers, these were grey up to the level of the tower deck, and black above. The very top, from which the antenna wires exited, were silver.
Periscopes – Grease marks (usually vertical) from the raising, lowering and swivelling of the periscopes were often visible on the stainless steel shafts. The tops of the periscopes were grey.
UZO – *Uberwasserzieloptik* (torpedo aimer) – From bottom to top - the base was grey, the compass heading ring was bronze, and the azimuth ring was black. Above this, the top removable part upon which the removable binoculars would sometimes

sit was grey. Since it was removable and often kept inside the U-boat, this top part was usually less weathered than the tower bulwark.
Inside of tower hatch – White with a red circular handle. The circular rim which is visible when the hatch is open was bronze.
Commander's flagstaff – This was often located on the starboard bulwark of the tower when a boat was in port, and would have varied in colour from boat to boat. The commissioning pennant, which was a thin white piece of material, was attached to the top of this flagstaff.
Flagpole – The flagpole holding the Kriegsmarine flag, which was situated at the rear of the tower railings, would have varied in colour from boat to boat.
DF aerial – The circular direction-finding aerial was located on the top of the right hand bulwark of the tower. It was black with a grey top and bottom, and an unpainted bronze stem.
Engine repeater dial – This dial was located at the front of the tower bulwark, ahead and to the left of the UZO (the torpedo aimer). It had black outsides and white insides.
Megaphone – A megaphone can sometimes be seen sitting on top of the UZO in some photos of U-boats. This seems to have been silver in colour.

Guns

88/105mm deck guns – The colours used upon the deck guns were not particularly consistent, and variations were common. The barrel, breech housing and main mounting body of the deck gun were often painted the same grey as the conning tower, but sometimes a darker grey colour was used. The base of the barrel (this was above the recoil tray), which slid back into a sleeve when the gun was fired, was heavily greased. The ring behind this, which acted as a guide for the barrel when it recoiled, was an unpainted metal which may have been bronze. The U-shaped padded gunlayer's harnesses were either artificial leather painted black or waxed canvas. The adjustable stems below were stainless steel. The circular control wheels were often painted black on the outside and grey on the inside. The handles for the control wheels were wooden, and presumably coated with black wood preservative. The ring above the base (below the main mounting body), upon which the compass headings were marked, was an unpainted metal, perhaps bronze. The upper half of the barrel was sometimes painted black or possibly dark grey for camouflage purposes (just as the horizontal surfaces of the conning tower were painted black). Even though the regulations called for "gradual transition" ie. feathered edges, the horizontal divide between the two colours had hard edges rather than feathered edges. Sometimes the top half of the mounting upon which the removable elevation and traverse sights sat, the top half of the controls and gearing arms, and the horizontal surface of the breech housing, were also painted black or dark grey.

Above: A pristine U 164 in 1942. The upper half of the barrel, the upper half of the mounting upon which the removable elevation and traverse sights would sit, and the top half of the controls and gearing arms are all black. Just behind the gun, at the front of the conning tower, can be seen the fairing which housed the magnetic compass. The upper half of the fairing is also black. The light grey looks like *Hellgrau 50*.
Photo source: Jung, Dieter, Abendroth, Arno and Kelling, Norbert. *Anstriche und Tarnanstriche der deutschen Kriegsmarine* (Painting and Camouflage of the German Navy). Bernard & Graefe Verlag, 1997.

20mm Flak gun – The adjustable stem, which allowed the height of the gun to be altered, was stainless steel. Grease marks from raising, lowering and swivelling would be visible. The padded shoulder supports may have been artificial leather painted black or grey or waxed canvas. The barrel was gunmetal, and everything else was grey. The earliest U-boats, which had the 20mm Flak gun mounted on the aft deck, sometimes had a thin black strip painted around the 20mm mount.

Hull

Diesel exhaust outlet – An area surrounding the diesel exhaust outlet, which was located along the free-flooding holes at the top of the stern casing, was sometimes

painted black or dark grey to disguise the staining that occurred due to the dirty exhaust gases which exited this outlet hole. The Type VIIs which had this feature tended to have the dark-painted areas around and below the exhaust outlet. On Type IIs and IXs this dark-painted area was very common, and was usually painted around and abaft of the exhaust outlet.

Waterline depth markings – Three sets of waterline depth numerals were marked upon both sides of the hull, making a total of six. These consisted of small white numerals that were aligned vertically. The first set was located a few feet aft of the bow, the second on the saddle tanks, and the third was a few feet forward of the stern. The first and second sets were of the same design. The top numeral, 0, started roughly at the division between the two greys, and the markings continued down the hull to 1 (0,9,8,7,6,5,4,3,2,1). The third set, at the stern, differed in that the top numeral was 4. This top numeral was much closer to the top of the hull casing. The numerals ran down the hull until the bottom numeral, which was also 4, was reached (4,3,2,1,0,9,8,7,6,5,4). The 0 numeral was located roughly at the division between the two greys. On each of the six sets, a white rectangle was located just forward of the 0 marking.

Above: A very cold U 751 in January 1941. The top of one of the six sets of white depth markings is visible at the right of the photo. The silver looking vertical stripe behind the tower rungs is possibly black paint shining in the brilliant sunlight. The white square and line at the top of the tower is a UAK tactical marking. To the rear is the boat's insignia (*bootswappen*), also known as emblem. It consists of an upright sword over blue waves and a golden sun. The sun is shining brightly upon the light grey *Hellgrau 50* tower and upper hull, and the dark grey antifouling *Schiffsbodenfarbe III Grau* on the saddle tank.
Photo source: Wetzel, Eckard. *U 995: Das U-Boot vor dem Marine-Ehrenmal in Laboe*. Karl Müller Verlag.

GHG (*Gruppenhorchgerät* – group listening apparatus) - These were acoustic listening devices that looked like a series of dots arranged in a semi-circle above both of the bow plane guards. They were bronze and usually left unpainted.
UT (*Unterwasser Telegraphie* - underwater telegraph) – The underwater telephone transducers consisted of two circles above the hydrophones, and two a few feet to the rear of the first pair. There were eight in total - four on each side of the hull. As with the GHG, they were bronze and usually left unpainted.
Propellers – Early U-boat propellers were made of bronze. Bronze propellers are bright and shiny when new, but turn darker and lose their shine with age. A slight greenish tint can accumulate in the corners. From about January 1942 the propellers were made of steel.
Propeller shafts - Anti-fouling dark grey.

Deck parts

Bollards – When a U-boat was being moored to a harbour or pier, ropes were attached to extended bollards. The sides of the bollards were usually grey, and the tops were the same black or dark grey colour as the metal parts of the deck. The sides would often be rusty because the ropes would wear away the paint.
Capstan – This retractable electrical winch was situated on the forward deck casing. The sides were often grey and the top was the same colour black or dark grey as the metal parts of the deck. The sides would often be rusty because the ropes would wear away the paint.
KDB – (*Kristalldrehbasis Gerät* – rotating hydrophone array) – The stem was usually grey, but sometimes red.
Wooden poles on deck – These would usually be painted with the same black wood preservative as was used on the wooden deck.
Rear navigation light – Clear white. On frontline U-boats the lenses and bulbs were removed.
Inside of galley hatch – White with a red circular handle. The circular rim which is visible when the hatch is open was bronze.
Insulators – These porcelain insulators were attached in groups of three to the jumping wires, and prevented electricity in the wires from short-circuiting on the metal parts of the deck. They were either brown or bottlegreen. One either side of each group of three insulators were tension adjusters, and these were grey.
Jumping wires – Unpainted steel. In port, the wires were sometimes charged with electricity. When the wires were carrying current, a yellow plate with a red lightning flash hung from fore and aft cables to warn of the threat of electrical shock.

Wooden deck

The colour of U-boat decks has been a puzzling subject for many modellers. The horizontal deckcasing was made of thin steel, over which wooden planking was applied. The primary reason for using wood was that a metal surface ices up much

more quickly in freezing weather than wood. Teak was too expensive to be used, so cheap local wood was used in its place. This explains why the wooden decks on U-boats did not exhibit the silvery appearance of weathered teak.

The painting list for U-boats in *Anstriche und Tarnanstriche der deustschen Kriegsmarine* (Painting and Camouflage of the German Navy) by Dieter Jung, Arno Abendroth and Norbert Kelling (Bernard & Graefe Verlag, 1997) states that the wooden deck was treated with a black wood preservative (*Teerfirnis Tf 99*). A U-boat deck started out as jet black in colour then quickly became charcoal in colour. As it was exposed to the elements, the deck developed a brown tinge. The more the deck was subjected to weathering, the lighter and browner it became. On the surfaces that were frequently walked upon, the wood preservative would wear more heavily and reveal more of the natural wood beneath. The deck would also become bleached by saltwater and the sun, causing small patches of white to appear. If a U-boat had not been serviced for many months, green algae would start to grow on the deck. As this plantlife was slippery, and therefore hazardous to the sailors walking on deck, the algae would not have been allowed to accumulate. It would have been removed before any serious built up took place.

The watertight ready-use ammunition hatches and some of the square-shaped hatches on the deck were not wood but metal. These were usually painted black or dark grey to match the treated wood. For the possible colour of the dark grey, see “horizontal surfaces” in the conning tower section above. In rarer cases the square-shaped hatches were painted the same colour as the conning tower. The extreme bow and stern sections were also not covered with wood; they were either painted the same colour as the conning tower and upper hull, or they were painted the same black or dark grey colour as was used upon the watertight hatches and the square-shaped hatches. These metal areas were prone to rusting, whereas the wooden areas obviously were not.

Above: The pristine looking Type IX U 128, with a *Hellgrau 50* tower, in May 1941. The freshly-stained wooden deck looks dark, with only a tinge of brown showing through. The metal hatch on the right of the photo, and the C-shaped metal part at the bottom of the photo, have been painted black.
Photo source: Köhl, Fritz and Niestle, Axel. *Vom Original zum Modell: Uboottyp IXC*. Bernard & Graefe Verlag, 1990.

Above: The wooden deck colour can be seen on the U-boats in the foreground of this 1942 photo, taken in Drontheim in 1942. More brown is apparent on the stained decks than on the photo of U 128 above. Another interesting aspect is that all the U-boats are painted in the same dark grey paint.

Photo source: Jung, Dieter, Abendroth, Arno and Kelling, Norbert. *Anstriche und Tarnanstriche der deutschen Kriegsmarine* (Painting and Camouflage of the German Navy). Bernard & Graefe Verlag, 1997.

During the loading of supplies before a patrol, numerous boxes would be seen on deck. The careless manhandling of these would have scraped and scuffed the deck. Also, when U-boats were in harbour or in dry-dock, their decks would be prone to paint and oil spills.

It is very important to recognise that a U-boat deck changed colour as it became more weathered. U-boats lying side by side would often have decks displaying different colours. These colours varied due to the conditions a deck had been exposed to, and the time since it had been last coated with preservative. This makes it difficult for a modeller to determine what a deck looked like at a certain point in time. The modeller must judge how weathered the deck had become by trying to establish when the U-boat was last given a major overhaul. A large degree of guesswork is required in this exercise.

An interesting point raised by Jeff LaRue is whether the colour characteristics of the deck preservative changed over the course of the war. Another related question is whether preservatives produced by different companies varied in terms of both colour and consistency. Yet another consideration is whether, late in the war, the supply difficulties reduced the availability of specified preservatives, and lesser quality alternatives were used in their place. Being unable to answer these questions, I can only speculate as to the variations between the preservatives used upon U-boat decks. But if there were variances, might the differences in the colour of U-boat decks in colour photos be due not only to weathering but the type of preservative itself?

Another aspect to consider is that a wet U-boat deck looks much darker than a dry one. A B&W photo of a weathered deck that is wet would look uniform and very dark – close in fact to the appearance of a clean, recently maintained dry deck in a B&W photo. This may confuse someone into believing a U-boat's deck had recently been scraped and coated with wood preservative, when it actually was a weathered deck that was merely wet.

Weathering above the waterline

Unlike the Kriegsmarine surface units, which spent much of their time in harbour, the U-boat fleet was heavily employed. At the end of a patrol, U-boats were often streaked with soot and rust. The state of the paintwork would often be a general indication of how long the patrol had lasted.

Rust - Modellers who wish to simulate rust on their model should understand that finding a rust-like colour and dabbing it on in places is not sufficient to obtain a realistic finish. They should study the different colours and types of rust that can be found, and where it tends to accumulate. Examining real ships is helpful, but the visual effects of rust can be found close to home on buildings, motor cars and road

signs. The scale of the subject must also be considered, since rust often forms in numerous small patches rather than one or two large areas.

Rust often starts out as red-brown, and gets darker to become dark red-brown or even brown-black when deeper. It is often found on the edges of surfaces, where the paint has been chipped away, and at the edges of panel lines (where dirt also accumulates). It can also cause the paint to blister. When the rust breaks the surface, the paint cracks and peels away, leaving the edges often curled outward. This rust is deep, and is often light brown to medium brown in colour, with dark brown mottles on top.

When rainwater is applied to rust, an orange-yellow residue is washed down below, or/and slightly around, the rust source. It washes down a variable distance depending upon the amount of water applied and the depth and area of the rust. Any corroding metal that is exposed to rain exhibits this rusty residue, which can frequently be seen on railings, lamp posts and old cars. In these cases it washes down vertically, but in ships the residue can sometimes be very slightly offset aft due to the forward motion of the vessel.

As early to mid-war U-boats spent 90% or more of their time on the surface, water and rain often flowed down the sides of the conning tower and upper hull to produce a lighter residue below the actual rust. This only occurs **above the waterline**; water does not wash down the lower hull of a vessel (when immersed in water) in the same manner. The only time this residue effect would occur below the waterline is if a U-boat was in an outdoor dry-dock for an extended period, thus exposing the U-boat's hull to rain.

Rust streaks built up particularly quickly on the upper sides of the saddle tanks, since water constantly ran down over these tanks. Another area in which rust built up quickly was the bottom of a U-boat's tower, where the tower meets the deck. This area rusted quicker than the upper hull because water slapped against the tower as the U-boat ploughed through the seas.

On surface vessels, rust is often produced when the anchor is dropped. The anchor scrapes away the paint below its housing on the way down, then again on the way back up. Rust was not commonly found below U-boats' anchors since they were not used regularly.

Paint peeling - When U-boats were subjected to heavy weathering, their top layer of paint would peel off in patches. This would reveal either the older paint or the red lead preservative beneath. As discussed later, the Germans sometimes used grey as the colour of their anti-corrosion undercoats in preference to red. The first area for this peeling to occur in was often the bow and/or the waterline, where water would splash against the hull and peel away the top layer of paint. Bumps and scrapes when manoeuvring in harbour would also have resulted in paint chipping and flaking away. Later in the war, the poor quality paint and undercoat did not adhere well to the galvanised steel used on some sections of conning towers. When U 505 and U 805 arrived in American ports the paint on the galvanised steel parts of their towers had peeled very much more heavily than on other areas.

Above: The dark blue paint (*Blauschwarz 58/2*?) on U 805's tower has peeled away from the galvanised steel parts of the tower very badly. In contrast, the medium blue-grey paint (*Dunkelgrau 51?* or *Blaugrau 58/1*?) on the steel upper hull has fared much better. This photograph of the surrendered Type IXC/40 was taken on the 14th May 1945 near Portsmouth, Virginia.
Photo source: Wetzel, Eckard. *U 995: Das U-Boot vor dem Marine-Ehrenmal in Laboe*. Karl Müller Verlag.

Scumline - A U-boat that had been around oil, scum, dirt and muck lying around a harbour would obtain a dirty scum line at the waterline. As U-boats were not trimmed identically every time, more than one scum line would sometimes appear. This scum line can easily be confused with the grassweeds line (see "Weathering below the waterline").

Diesel exhaust staining - Dirty exhaust gases from the diesel engines were expelled from the hull through the diesel exhaust outlets, which were two small holes (one per side) located along the free-flooding holes towards the stern. Staining from these gases would build up on the hull around and abaft of this hole. This was very common, and only freshly-painted boats would not have some sort of staining in this area. The area surrounding the two diesel exhaust outlets was sometimes painted in dark grey or black to disguise the exhaust staining.

Fading - Paint fades quickly in salt water, but as the upper works of an early-to-mid-war U-boat were only submersed for 10% of the time, it would take longer for the paint above the usual waterline to fade than the paint below the waterline. The sun also causes paint to fade.

Salt - The white streaks that would sometimes appear on U-boat saddle tanks were caused by salt water, but would wash off when the U-boat returned to sea.

Smudging behind tower rungs - When sailors climbed up and down from the tower, the toes of their dirty boots often smudged the light grey paint behind the tower rungs. The practice of painting a vertical stripe behind the rungs may have been instituted so that these smudges were not so noticeable.

Plantlife - Later in the war, when U-boats were fitted with schnorchels, they spent most of their time underwater. They could not travel faster than 6 knots as the periscope would tend to vibrate, so their usual underwater speed was a mere 4 knots. The whole hull and conning tower of the boats fitted with schnorchels were prone to attracting plantlife and algae. Barnacles were able to attach themselves all over the boat, and even on the bridge. Since these U-boats' waterline was effectively above them, the rust residue effect previously discussed only took place when they were in port.

Shadow lines - In some photos of U-boats, vertical lines can be seen at regular spacing intervals along the hull casing. This is where the high water pressure present at deep depths has pressed in the areas of casing with no internal support, causing a shadow line to appear between the areas of the casing that have internal support and the areas that do not. Illustrations that include these shadow lines tend to overdo them.

Commissioning - It should also be noted that U-boats received a fresh coat of paint for their *Indienststellung* (commissioning ceremony). Since this was merely decorative, it would often be applied above the waterline only. U-boats would therefore not be weathered on the day they were commissioned.

General - The following passage is from *Iron Coffins* by Herbert A. Werner (Cassell Military Paperbacks, 1999) –

"The boat was weatherbeaten. The conning tower looked like a surrealistic painting. The protective red undercoat showed in streaks through the splintered grey surface paint. Rust had formed everywhere, even around the barrel of the heavily greased 8.8cm gun on the foredeck. There was a light green shine of algae on the wooden deck that covered the steel hull. Her rundown appearance was obviously the result of months of drills in the Baltic, and I found it very appealing."

It is surprising that algae was allowed to build up on the wooden deck. Algae is slippy, and presents a hazard to crewmen who might loose their footing. Common sense dictates that algae would normally be removed from U-boat decks.

Presumably the reason that U 557's appearance was allowed to deteriorate was because the crew of the U-boat had been training in the Baltic for many months. Had it been on active duty, it would have been overhauled and repainted more often. The

assertion that operational U-boats were regularly overhauled and repainted is supported in a recorded conversation between German sailors in captivity, as published in *Black May* by Michael Gannon (Aurum Press, 1998) –

Radioman from the surface tanker *Germania*: Is a boat [U-boat] painted each time it sails?
Spitz [U-boat sailor]: Yes, scraped and repainted.
Kalisch [Second U-boat sailor]: Strelow's boat [U 435] once came back entirely covered with rust; he had been out for twelve or thirteen weeks. The whole boat was a reddish-brown.

Weathering below the waterline

The question of what U-boats looked like below the waterline after they had been exposed to the sea for a period of time is a difficult one to answer. Many of the illustrations depicting the lower hulls of U-boats are inaccurate. Rust, dirt and paint peeling can be completely out of scale, and barnacles and other plantlife can be completely neglected. The black and white photos of U-boats in dry-dock do give us some clue, but it can be difficult to tell what we are looking at. The following points should give a modeller a starting point from which they can weather the lower hull of their model. Though this requires thought and imagination, it does benefit from the fact that a great deal of artistic license is allowed in such an endeavour.

Anti-fouling paint - As the primary purpose of anti-fouling paint is to inhibit corrosion, the main ingredients in these paints are rust inhibitors. The secondary purpose is to discourage the growth of marine organisms such as algae and barnacles. Lots of this growth can actually reduce the speed of a ship by a few knots, thus reducing the vessel's fuel economy. This is addressed by the inclusion of a poison, which gradually leeches out of the paint and kills anything trying to live on it. The poisons used in the Second World War were mainly suspended tin or copper particles. U-boats were often put straight into the water after a quickly-applied coat of anti-fouling paint so that the paint had not had enough time to dry. This was because a hardened coat of anti-fouling paint would inhibit the release of the poisons. When anti-fouling paints lose these poisons to the water, they tend to fade, often quite quickly. Therefore, the hull of a U-boat that has been in the water for a period of time would be **lighter than RAL7016**.

Grassweeds line - Algae, moss and seaweed often float on the surface, and tend to attach onto hulls at the waterline more heavily than elsewhere on the hull. This creates a "grassweeds" line (or "grass-skirt") for up to a foot in width just below the normal waterline. It takes about a month or two in warm water, and perhaps six months in cold water, for a foot-wide fringe of algae to appear at the waterline. The Type IXs that sailed to the Indian Ocean on patrols which lasted several months would have accumulated a wide grassweeds line on each side of the hull by the conclusion of their patrol. By way of contrast, early war U-boats returning from the

more usual five or six week duration Atlantic patrols would only have had a **little** amount of plantlife on their hulls.

Above: The black horizontal line on this unidentified Type VIIC in dry-dock is a "grassweeds" line. It has built up on top of the dark grey anti-fouling paint, and is located well below the division between the two greys.
Photo source: Showell, Jak P. Mallmann. *U-Boats In Camera*. Sutton Publishing, 1999.

Above: A grassweeds line of assorted colours has built up over most of the black bootline on the *USS Cole*. Other plantlife is visible on the starboard rudder. When weathering their ship models, many modellers neglect the plantlife that builds up on the lower hulls of vessels.

Above: The USS *Ohio* in dry-dock. The black submarine must have been lying in water for a long enough period that plantlife has adorned not just a foot or two under the waterline but for much of the lower hull. There is far less coverage farther down the hull. The area that would have been above the waterline is free from crud.

The grassweeds line can vary in colour from green to umber (dark-brown to green-brown) to ochre (moderate yellow-orange) or even white. As this line accumulates more plantlife, strands can hang down the hull in varying lengths. In very general terms, warmer waters produce greenish colours (algae) and colder waters produce whites and browns. Also, a grassweeds line that has built up in salt water will fall off in fresh water, and a grassweeds line that has built up in fresh water will fall off in salt water.

Algae and barnacles - If a U-boat was immersed in water for a long enough period, algae would also accumulate on other areas of the hull. Generally, there would be no algae on the bottom of any horizontal surfaces or the dive planes.

U-boat hulls also attracted barnacles. These are round-shaped shells of white or brown-white colour. They are usually ¼ to ¾ inch in diameter but can grow to up to two or three inches in diameter. Since they feed on plankton, barnacles like to be in an area where there is current. They don't attach to a ship much while underway unless a boat is travelling at a slow speed. When this happens, the barnacles attach randomly to a boat's hull almost anywhere except the propellers and the leading edges of the rudders, dive planes and bow, where the passage of water is too fast for them to hold on. Whenever a boat is in port barnacles will attach onto the hull. When dead they tend to fall off the hull, leaving a faint white ring where they were located.

Paint peeling - As with the paint above the waterline, the anti-fouling paint was prone to flaking or peeling away when worn. This would to expose the older paint or even the anti-corrosion undercoat beneath.

Dry-dock - When a U-boat returned from an operational patrol the Engineering Officer passed on a list of defects to a representative of the shipyard, who would then see to it that the defects were rectified. The amount of time that this would take would be one of the most important factors in deciding when the U-boat would depart on its next patrol. If there was any damage to the hull through grounding, or any damage to the hydroplanes, UWT, hydrophones, diving valves or propellers, this would necessitate work being carried out in dry-dock. The harbour locks and U-boat pens allowed for regular dry-docking opportunities. That said, dry-dock facilities would only be made available if work had to be carried out on lower sections of the hull.

Since algae and barnacles can actually slow ships, all the plantlife would be removed when a U-boat was in dry-dock. This would be done as soon as the water was pumped out of a pen or harbour lock because once a hull becomes dry, the algae and other forms of plantlife are much harder to remove. A fresh coat of paint would usually be applied during a visit to dry-dock. However, the anti-fouling paint, being much more expensive, would only be applied if necessary.

Since dry-docking facilities were not always available, maintenance and repainting were sometimes carried out when a U-boat was still in the water. The cleaning of a scum line or the removal of plantlife at the normal waterline level could be done by trimming the U-boat to a high level, thus raising the normal waterline clear of the water. The lower hull, still being in the water, would not be available for maintenance at this time.

Interior colours

The 1/125th Revell Type VIIB U 47 kit has cutaway sections that reveal the interior of the U-boat. Similar sections detailing interior spaces have been produced in resin by CMK for the popular 1/72nd Revell Type VIIC kit. Modellers of these kits may find the regulations in the following addresses to be of use since they include details of which colours were to be used on U-boat interiors –

http://www.u-boot-archiv.de/dieboote/farben_maerz_1940.html
http://www.u-boot-archiv.de/dieboote/farben_juli_1944.html

For anyone who is not proficient with the German language, the following website may help in translating the German text –

http://babelfish.altavista.com/babelfish/tr

A brief summary

Wartime Kriegsmarine U-boats were painted in two greys. The lighter grey was painted on the conning tower, the upper hull (above the waterline). The second anti-fouling dark grey was painted on the lower hull, below the waterline. The horizontal division between the two greys took place just below the free-flooding holes on the hull. Some boats had the tops of their saddle tanks painted in the upper colour, whereas most had the whole of their saddle tanks painted in the lower anti-fouling colour. The steel horizontal surfaces at the extreme bow and stern were either painted in the upper lighter grey or black. Bootlines were not applied, and the wooden deck was coated with a black wood preservative.

Adherence to the RAL or Federal Standard codes are not necessary by modellers because the Kriegsmarine paints varied in colour. The weathering suffered by a U-boat would further alter the colour.

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Primary sources

March 1940, November 1941 and July 1944 editions of *Allegemeine Baubestimmungen Nr.31* (building regulations form Nr. 31)

Secondary sources

Gannon, Michael. *Black May*. Aurum Press, 1998.
Högel, Georg. *U-Boat Emblems Of World War II 1939-1945*. Schiffer Military History, 1999.
Jones, Daniel H.. *Kriegsmarine Camouflage 1939-45* (from http://smmlonline.com/).
Jung, Dieter, Abendroth, Arno and Kelling, Norbert. *Anstriche und Tarnanstriche der deutschen Kriegsmarine* (Painting and Camouflage of the German Navy). Bernard & Graefe Verlag, 1997.
Paterson, Lawrence. *Second U-Boat Flotilla*. Leo Cooper, 2002.
Showell, Jak P. Mallmann. *7th U-Boat Flotilla*. Ian Allan Publishing, 2003.
Showell, Jak P. Mallmann. *U-Boats In Camera*. Sutton Publishing, 1999.
Stern, Robert C.. *Type VII U-Boats*. Brockhampton Press, 1998.
Stern, Robert C.. *U-Boats In Action*. Squadron/Signal Publications, 1977.
Ullmann, Michael. *Luftwaffe Colours 1935-1945*. Hikoki Publications Ltd., 2002.
Werner, Herbert A.. *Iron Coffins*. Cassell Military Paperbacks, 1999.
http://www.ipmsstockholm.org/helpdesk.aspcolor_charts
http://www.shipcamouflage.com/

Useful links

Articles dealing with the colours used upon German naval vessels can be found at –
http://smmlonline.com/articles/kriegsmarinecamo/kreigsmarine.html
http://german-navy.tripod.com/sms_paint-overview.htm

The Snyder & Short Enterprises paint chip cards can be found at –
http://whiteensignmodels.com
http://www.shipcamouflage.com/

The Colourcoats naval range of enamel paints can be found at the White Ensign Models link above. The JPS Modell range of acrylic paints can be found at –
http://www.jpsmodell.de/shop/jpswn_e.htm

Two editions of the building regulations form Nr. 31, which specifies the application of paints upon U-boats, can be found at –
http://www.u-boot-archiv.de/dieboote/farben_maerz_1940.html
http://www.u-boot-archiv.de/dieboote/farben_juli_1944.html

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Colour reference charts can be found at –
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