



The Wolf Pack

A Collection Of U-Boat Modelling Articles

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Accurate Model Parts



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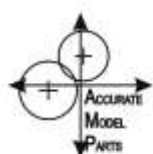
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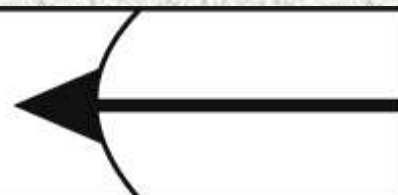
*Super-detailing Revell's 1/72nd Type VIIC U-Boat by Wink Grisé
All other articles by Dougie Martindale



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Introduction

Many of our Accurate Model Parts forum members were inducted into the realm of U-boat research in a similar fashion. Spread throughout the globe as we are, many of us came to study U-boats through the building of a model kit. In most cases this entrance came via Revell's 1/72nd Type VIIC U-boat (RV5015) model kit. Our common desire to correct and improve this particular model kit has advanced our understanding of the external characteristics of the Type VII by a great deal. The foremost conduit for our increased knowledge is the sharing of information via various internet forums. Yet the primary catalyst in the development of the U-boat modelling scene is arguably the Revell VIIC kit itself.

The Wolf Pack is a collection of articles dealing with various issues pertaining to the U-boat modeller. Due to the impact of the aforementioned Revell kit, particular emphasis has been placed on covering issues that may be of interest to the modeller building this particular model kit. I have made no attempt to delve into a technical analysis; my points are intentionally limited in scope to those of specific interest to the U-boat modeller.

I would like to thank my Accurate Model Parts colleague Wink Gris  for allowing me to include his U 557 build article in this collection.

Induction

My own induction to the world of U-boat models derived from an earlier model kit: Amati's mixed media 1/72nd scale U 47. I spent several months on what is generally regarded as a notoriously challenging build. The Amati kit took my modelling into new areas, allowing me to improve certain skills that were not being developed when I had been building simple injection-moulded kits. Having spent some rather pleasant evenings over-weathering the model, I began to wonder if the lovely red hull on my model was indeed historically accurate. Should the hull be red or dark grey? And did the real boat really have a thin black bootline? These simple questions would divert me away from my usual 1/72nd aircraft subjects on a completely new tangent. Indeed they were the genesis of this collection of articles.

Rather than take to another aircraft model, I began researching the paint colours of the famous Type VIIB U-boat U 47. This led to a work-in-progress article on U 47's colours being published in the December 2003 (#55) issue of the SubCommittee Report (SCR). The SCR is a quarterly magazine published by the SubCommittee, a non-profit organisation who share an interest in submarines, primarily the building of radio-controlled submarine models.

Although it may seem slightly implausible now, many modellers of a decade ago were opting for a red hull and a black bootline on their U-boat models. With very few exceptions, almost all modellers were painting their upper hulls with light grey paint. This practice continued despite the many photos in common circulation showing various shades of greys on the upper hull. There was no real guidance on these matters, and it appeared that no researcher had analysed U-boat colours in any real depth.

Following a request by the SubCommittee editor Jeff LaRue, I began researching an article on U-boat colours. Such an undertaking would not be complete without access to primary resources. By a stroke of good fortune, I was sent photocopies of several Kriegsmarine painting regulations by David E. Brown. Some have not, as yet, been published in English language books or the internet. With this primary material, and a growing mini-library of U-boat books, I was able to write *Kriegsmarine U-Boat*

Colours & Markings. This three-part article was published in the September 2004 (#58), December 2004 (#59) and March 2005 (#60) issues of the SubCommittee Report. The article is offered in this collection, albeit with different photos than were included in the original publication.

In tandem with my research on U-boat colours, I continued to study U 47 in detail. This necessitated collecting as many photos of the boat as possible. Once I had collected over 200 photos of the real boat, multiple serious inaccuracies became apparent in the Amati kit. By analysing these photos, it also became obvious that certain external characteristics of the boat changed over time. Indeed I could not compare period photos to the Amati kit without first establishing when the photo had been taken. This analysis allowed me to appreciate how U 47 and other U-boats were modified over time. An article entitled *Evolution Of A Type VII U-Boat: U-47 Modifications* was published in a later SCR.

While the modifications were directly linked to modelling, I began to branch out to other areas of my chosen boat. I began writing of the operational history of the U 47, the personal history of the serving officers, and the boat's famous exploits in Scapa Flow. I also spent significant time on a number of side profiles, and also completed artwork for the various versions of the snorting bull insignia. This writing and artwork was far removed from my now-neglected hobby of aircraft modelling.

The introduction of another model kit would keep me away from the table for longer still.

A seminal release

In late 2003, a significant development occurred with regard to U-boat modelling. Revell released an injected moulded 1/72nd Type VIIC U-boat (RV5015) model kit. When the first photos of an unpainted model appeared on Revell's website, we could all see that this modern kit was equal in quality and accuracy to many contemporary releases.

The general consensus of opinion on the new kit was very positive, there being genuine excitement at the prospect of building the boat. The pointed bow, the rivets, the doublers – they all looked amazing. But it soon became apparent that the kit did have certain faults: the smaller free flooding holes had been replicated with rectangles rather than ovals; and the length of the torpedo doors gave an appearance that did not look quite right. In time a more involved evaluation would reveal more errors.

Modellers who were used to very accurate kits were occasionally disparaging about certain features of the Revell U-boat. These modellers tended to have come to the subject *after* the release of this seminal kit. Using the Revell kit as their baseline, they were less forgiving of its errors. By way of comparison, modellers who had struggled to fix the multiple fallibilities of the now redundant Amati kit, or who had tried in vain to improve the old 1/125th scale Revell U-boat kits, had a more positive outlook. They appreciated that the new Revell kit was a state of the art masterpiece when compared to the predecessors. The most important factor was that Revell had managed to successfully replicate the clean aesthetic curves of the Type VIIC. Even an out-of-box build *looked* like a VIIC. At long last we had an affordable and reasonably accurate VII model to work with.

The potential of the near metre long kit was obvious. The scale allowed a level of detail that cannot be considered in 1/350th or 1/144th scales. But the central asset of the kit was the wonderful looks of the Type VIIC itself. The visual impact of a VIIC of this size enticed many modellers away from their usual armour and aircraft subjects and into the sphere of the U-boat. It was also obvious that aftermarket companies would swarm around this kit, releasing brass and resin sets for a market full of new U-boat enthusiasts. In the early months of 2004, everyone looked intently for the release of aftermarket sets. The demand for a replacement deck was satisfied by Modelbrass and Nautilus. White Ensign and Eduard released their sets to the approval of us all. Yet once the main aftermarket companies had released their sets, it became apparent that a few aspects had not been addressed. For example, the over-long torpedo doors and the free-flooding patterns could not be easily rectified without suitable photo-etch pieces.

To highlight these issues, I penned an article entitled *Type VIIC Free-Flooding Vent Patterns* for SCR#62. An updated version of this article can be found in this collection. Following this article I was contacted by Wink Gris , a modeller who was researching U-boat material for his U 557 build. In our discussions we decided that no aftermarket company would release a set to correct the free-flooding inaccuracies in the Revell kit. Together we had the research knowledge and photo-etch design skills to produce such a set. So we teamed up to design the product, releasing it under the name U-Brass.

The allure of the VIIC

While the Amati kit had taken my modelling in a different direction – to writing articles rather than just sticking my grubby fingers together – the Revell kit had taken me into the realm of co-designing aftermarket sets. The Revell kit was also the catalyst for researching the entire class of Type VIICs. With a subject field of hundreds of boats, this area of research was far more expansive.

There was one pivotal factor that allows the VIIC enthusiast endless scope for research: the boats were constantly modified in an attempt to meet evolving technological requirements. Throughout the course of the war, older equipment was replaced by more sophisticated kit. As a result, each of the VIICs and VIIC/41s had different features over time. For example, U 93 may have originally shared very similar features to U 94. Yet there would be small differences between the two boats, and these differences would appear at slightly different time periods. The boats themselves would also change over time with respect to paint colours and insignia. Almost every boat was therefore unique.

When we consider that there were roughly seven hundred boats in the Type VII class, that most of the boats were different in some respect to others, and that many had interesting operational careers, the modeller is therefore presented with a near endless supply of choices. It is this facet of U-boat modelling that can be very alluring. The multitude of possibilities allow the modeller a wealth of choices: there is always another boat to model, with dissimilar features to portray. Even after years of study, a new photograph will reveal a new insignia or different technical feature.

Yet these very same factors may be construed as a nightmare for the novice modeller. The initiate is beset with obvious difficulties: how on earth can they build an accurate replica when there is so much variation? With only a few books at their disposal, how can the modeller possibly learn about all the modifications? And how are they supposed to know when the relevant modifications were made to their chosen boat? They may find a few photos of their chosen boat but these photos will only provide clues on certain features. They may have three photos but each photo may be taken a year apart, leading to puzzlement as to why the same boat has different features, different paint schemes and even different insignia.

This scenario may be seen in a different light depending on the disposition of the modeller. If they wish to spend the majority of their free time at the modelling table, the modeller will be best served by conducting an out-of-the-box build. However, if they are more patient and inquisitive type, who is content to communicate on internet forums, to collect books and examine them with a magnifying glass, and to expend years rather than months on any given subject, modelling the Type VIIC can become an engrossing pastime.

A growing collection

In any true super detailing project, the modeller will need to be armed with a range of modelling products and the expertise to use them. Yet just as important to the project is knowledge. Without a detailed appreciation of the subject garnered through research, the super detailer will not be equipped with enough knowledge to achieve their full potential.

I was acutely conscious of the complications associated with amassing research material on the VIIC. Even with a dozen books, the modeller will find enormous difficulty in assessing how their chosen boat was modified and what features were present at a given time. No one book was available to

help answer these questions. To begin to address this subject I started to write a summary exploration of the subject. Due to other commitments the resulting article - *Type VII U-Boat Modifications* – would take three years to complete. Constantly aware that my target audience was the modeller of the Revell VIIC and VIIC/41 kits, I took care not to diversify to technical considerations.

When I began writing this article, I had been frustrated by the lack of an ideal conduit with which to share the information. Yet this predicament was solved when Wink and I team up again, this time as Accurate Model Parts. With the formation of our own website it was possible to release our own articles as downloadable pdf files. This fitted our philosophy of helping other modellers, by releasing products and sharing our research information.

In the AMP library section we added *Kriegsmarine U-Boat Colours & Markings* and an updated version of *Type VIIC Free-Flooding Vent Patterns*. In the USN SUBS section of the library, articles aimed at assisting the Gato modellers were prepared by Wink and others. Wink also created the AMP forum to allow like-minded submarine model-makers the opportunity to freely share information.

Now that we had a library section to release articles, and a forum in which the subjects could be discussed, I was free to pen other articles. I modified an existing U 47 insignia article to a new generic version entitled *The Snorting Bull Insignia*. Knowing the interest in the sawfish insignia I then wrote *The Laughing Sawfish*. This short article discusses the debatable points regarding sawfish colours but does not offer any resolutions.

In the winter of 2008/2009, Wink and I decided to add U-boat victory pennants to our range of flags. It became apparent that some of our pennant customers would need guidance on the subject. An article entitled *German U-Boat Victory Pennants* was our method of addressing this issue. At some point in 2009 I finally found the time to complete the article *Type VII U-Boat Modifications* and release it on the AMP library section. With various ongoing commitments I had envisaged this to be my last article for the U-boat modeller. Yet almost by accident I penned *U-Boat Model Kits & Accessories* during a festive break. Starting as a brief list of accessories for the Revell VIIC kit, it somehow became a tabular list of U-boat model kits and accessories for all scales.

Upon completion of *U-Boat Model Kits & Accessories*, there were now seven downloadable pdf articles in the series. Rather than seven distinct downloads it seemed worthwhile to amalgamate them all into one downloadable file. The incorporation of a table of contents and an index would allow for improved searching functionality. Now that the articles were being collated, I decided to tie up a few loose ends. I listed the known inaccuracies and issues in the Revell VIIC kit in the appendix entitled *Revell Type VIIC Checklist*. To assist the modeller who is navigating the early steps of research, who has no idea which books to purchase, I listed the books that have been of benefit to me in the appendix *Recommended Reading*. The last inclusion was Wink's U 557 build article *Super-detailing Revell's 1/72nd Type VIIC U-Boat*. I am grateful to Wink for allowing this to be included as it acts as the final piece in the jigsaw.

The Wolf Pack

In recent years the full potential of the Revell kit has been realised. Armed with aftermarket sets and research material, several modellers have utilised their considerable talents to produce extremely accurate models. The blogs and online posts of these very skilled modellers allow others to follow in their footsteps.

The purpose of this collection is to equip modellers of all levels with some of the research tools needed to complete an accurate VIIC model. I hope that it may act as a starting point for further discussion by other modellers on our forum. If skilled modellers and researchers continue to share resources via this medium, our combined knowledge will inevitably lead to a better understanding of this fascinating subject.

Dougie Martindale, May 2010

Spanish translation

Five of the articles contained in this collection can be found in Spanish at <http://www.u-historia.com/>
The articles can be found by following the section and subsection hyperlinks listed below.

⊕ **Kriegsmarine U-Boat Colours & Markings**

- Spanish title Colores y símbolos de los Uboot
- Website section Técnica
- Subsection Artículos Históricos
- Translators and collaborators Felipe Carmona Hernández, Guillermo Martínez, Alonso Espinosa, Dani J.Åkerberg, Francisco Pérez de Nanclares, José Carlos Violat, Ombretta Lotti y Alejandra Lifischtz

⊕ **Type VIIC Free-Flooding Vent Patterns (original version)**

- Spanish title Patrones de los agujeros de inundación libre de los Tipo VIIC
- Website section Técnica
- Subsection Artículos Históricos
- Translator Dani J.Åkerberg

⊕ **Type VII U-Boat Modifications**

- Spanish title Modificaciones externas en los uboot del Tipo VII
- Website section Técnica
- Subsection Artículos Históricos
- Translator Dani J.Åkerberg

⊕ **The Snorting Bull Insignia**

- Spanish title El emblema del "Toro resoplando"
- Website section Historia
- Subsection Artículos Históricos
- Translator Dani J.Åkerberg

⊕ **The Laughing Sawfish**

- Spanish title El U96 y el "Pez sierra sonriente"
- Website section Historia
- Subsection Artículos Históricos
- Translator Dani J.Åkerberg

The SubCommittee Report articles

The SubCommittee Report (SCR) is a quarterly magazine published by the SubCommittee, a non-profit organisation who share an interest in submarines, primarily the building of radio-controlled submarine models. Their website can be found at <http://www.subcommittee.com/>

⊕ U-boat Color Schemes*

- December 2003 (#55) SubCommittee Report
- * This article is a very early discussion of U 47 paint colours

⊕ Kriegsmarine U-Boat Colours & Markings

- September 2004 (#58), December 2004 (#59) and March 2005 (#60) SubCommittee Report

⊕ Type VIIC Free-Flooding Vent Patterns

- September 2005 (#62) SubCommittee Report

⊕ Evolution Of A Type VII U-Boat: U-47 Modifications*

- March 2006 (#64) SubCommittee Report
- * This article discusses modifications only

Additional articles

⊕ U 47 Modifications & Colours

- <http://www.modelshipwrights.com>

Follow the following hyperlinks:

- Features
- Ship Articles By Class
- Submarines
- Reference
- U 47 Modifications & Colours

Kriegsmarine U-Boat Colours & Markings

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Part I - Introduction

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.

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.

Part II – 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.

Part III - Standard Kriegsmarine Paints

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.

German colour terms	
German	English
Grau	Grey
Grün	Green
Blau	Blue
Braun	Brown
Oliv	Olive
Weiß	White
Rot	Red
Schwarz	Black
Schlick	Mud
Hell	Light
Mittel	Medium
Dunkel	Dark

Above: The names of Kriegsmarine paints were, not surprisingly, in German. The translations above will help those of us who are unfamiliar with this language.

Paint, RAL and Federal Standard matches for Kriegsmarine paints								
	<i>Hellgrau 50</i>	<i>Hellgrau 50 (alt)</i>	<i>Dunkelgrau 51</i>	<i>Dunkelgrau 52</i>	<i>Schiffsbodenfarbe 111 Grau</i>	<i>Schlickgrau 58</i>	<i>Blaugrau 58/1</i>	<i>Blau-schwarz 58/2</i>
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
Colour-coats	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 to the right were ever used on U-boats. These colours were specified in the November 1941 painting regulations.

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 –

Other Kriegsmarine colours		
Number	Paint name	Colour
31/1	<i>Hellgrau</i>	Light grey
31/2	<i>Dunkelgrau</i>	Dark grey
32/1	<i>Hellgrün</i>	Light green
32/2	<i>Dunkelgrün</i>	Dark green
32/3	<i>Olivgrün</i>	Olive green
32/4	<i>Hellbraun</i>	Light brown
32/5	<i>Dunkelbraun</i>	Dark brown
32/6	<i>Rosa</i>	Pink
32/7	<i>Blau</i>	Blue

⊕ *Dunkelblaugrau* (dark blue grey, FS35044)

- ⊕ *Mittelblaugrau* (medium blue grey, FS35240)
- ⊕ *Hellblaugrau* (light blue grey, FS35488)



Above: The colours in the guide above 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.

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 deutschen 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.

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.

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



Above (A1): 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.



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

Left (A2): 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.

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 on the previous pages, 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.

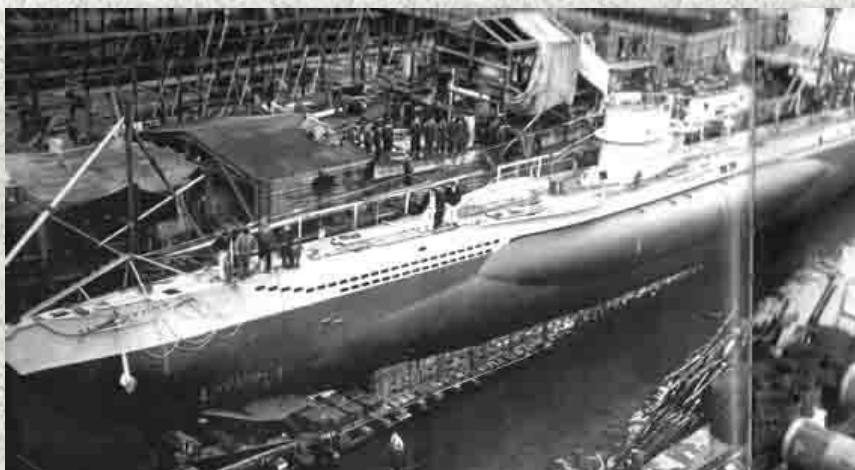
This variation in colour is much greater than I had expected. Falk Pletscher astutely notes upon the variation in the colour of the *Hellgrau 50* paint that, “I am quite sure that the colour of the paint *Hellgrau 50* was not exactly defined. Otherwise it would have been taken into the RAL register.”

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.

Part IV - U-Boat Colours

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 VIAs) 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 (A3): 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.

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.

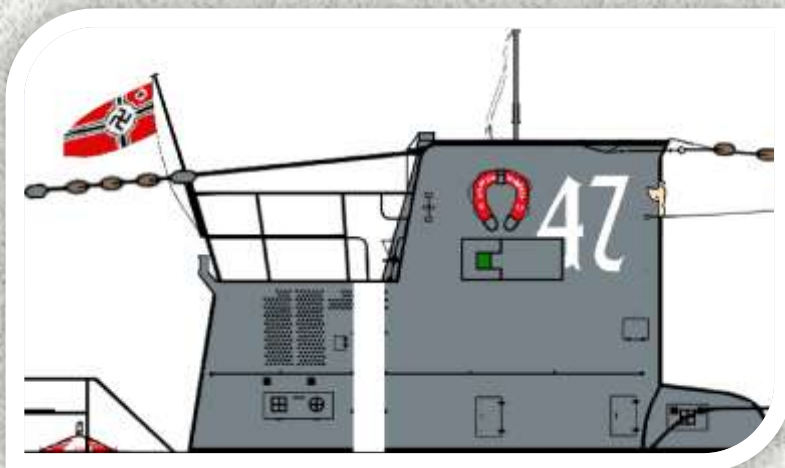
To conclude, I find that although there is no positive evidence of the use of red on pre-war hulls, the possibility cannot be completely discounted. But I would suggest that it would be prudent of modellers who choose a pre-war U-boat not to use red unless positive confirmation comes to light. If a wartime 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 metre 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.



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.

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.

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.

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



Above (A4): 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.

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.



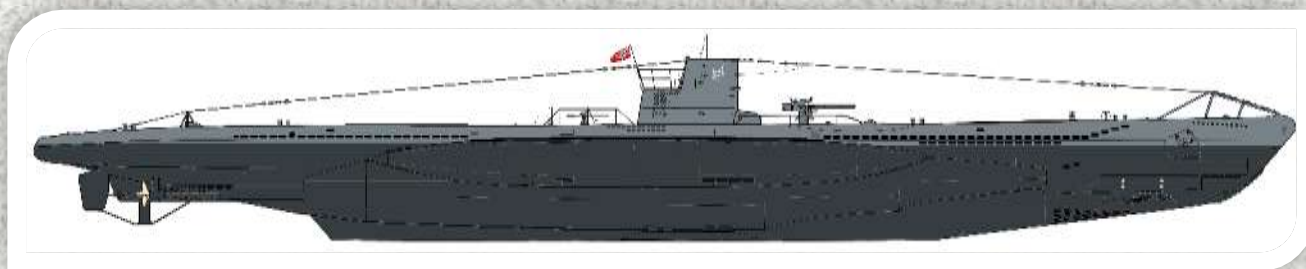
Above (A5): The *Saltzwedel* Flotilla in Bremen during 1937. Once again different schemes are evident, and again the presence of the tender helps us with paint colours. Most of the boats are darker than the tender's *Dunkelgrau 51* hull; they may be in *Dunkelgrau 52*. U 33 is painted in alternative Spanish Civil War markings.

If one sees a photo of a pre-war boat with a U-number in dark grey/black, it is likely that the upper colour was *Hellgrau 50* (or that the tower was white). White numbers wouldn't show up very well on such a light grey background so dark grey or black numbers were used. On boats with a *Dunkelgrau 51* upper colour, or darker, the white numbers were used.

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. On page 6 of *U-Boot Im Focus* Edition 3, there is a very clear and interesting U-boat photo. The shot is of an original VII with the U-number 26 painted in white on the tower. The boat is unmistakably an original VII, and certainly **not** the Type IA U 26. The photo proves that the U-bootwaffe were using false U-numbers in the pre-war period. This was almost certainly a deliberate ploy to confuse others as to the U-boat's real identity.

Wartime upper greys

Immediately prior to the war, the most common scheme within the U-boat fleet consisted of *Dunkelgrau*

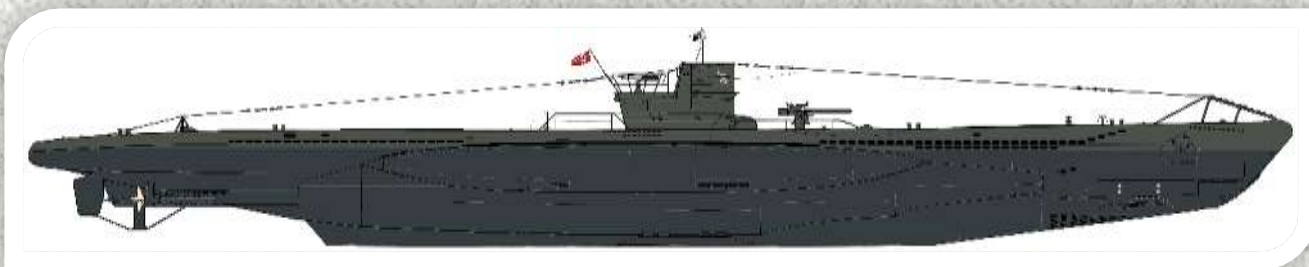


Above: An early Type VIIB U-boat with *Dunkelgrau 51* (RAL7000) as the upper colour and the standard *Schiffsbodenfarbe III Grau* (RAL 7016) on the lower hull.

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 when launched.

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.

Another colour which was commonly 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.

One factor which may have caused some confusion regarding U-boat upper colours is the name of the *Dunkelgrau 51* paint itself. Although “dunkel” means dark, the paint was very far from a dark grey. It wasn't even on the darker side of medium grey. As the above photo above shows, if anything the so called “Dunkelgrau 51” was on the lighter side of medium grey. The *Dunkelgrau 51* name is



Left (A6): If we could see only the right half of this photo, may we have assumed the upper colour of the original VII was the light grey *Hellgrau 50*? The ship in the left hand side provides us with a vital clue. Once again the ship has a *Hellgrau 50* superstructure and a *Dunkelgrau 51* upper hull. The U-boat was therefore probably in *Dunkelgrau 51*.

therefore a misnomer.

Many modellers, of course, have assumed that *Dunkelgrau 51* was dark grey. In thinking this, they would next think that the upper colour in U-boat photos could not possibly be the “dark grey” *Dunkelgrau 51*. Rather it must be the light grey *Hellgrau 50*. Others do know the true shade of *Dunkelgrau 51* from paint charts. But the “Dunkelgrau” name can still exert influence, leading to a preference for *Hellgrau 50*.

Over the years many modellers have chosen a light grey paint for their upper hull on their U-boat models. One could argue that the medium and dark grey colours have not been chosen frequently enough. Furthermore, a good case could be made that U-boat upper colours were often darker than many enthusiasts have realised. This is particularly true of the mid to late war period, when light grey upper colours were less common.

For those who still hold that the light grey *Hellgrau 50* paint was “standard” on U-boats, let us refer to the painting regulations. The March 1940 edition states that either *Dunkelgrau 51* or *Schlickgrau 58* were to be used; the November 1941 regulations and the July 1944 regulations both state that *Schlickgrau 58* was to be used. We remember that the shipyards had to ask the High Command for instructions on painting the upper colour of each individual boat, so in practice there were a few paints to choose from. But the two paints specifically mentioned in the regulations did not include *Hellgrau 50*. The light grey *Hellgrau 50* was certainly commonly used, but equally certain is that this paint was not the “standard upper colour”.

As well as the High Command, 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 at the *Germaniawerft* shipyard.

We should remember that U-boats often sported different colours at various times. Even boats that sailed from the same Atlantic base on every patrol were subject to paint colour changes. There are a multitude of possible reasons for these changes. A lack of availability of a particular paint at a certain time, the preference of a new commander for a camouflage scheme, or a change of operating base could all be potential reasons.

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 sometimes 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.

A number of colour photos of the school U-boats based at Gotenhafen in the winter of 1941/42 show all of the upper colours to be the same dark grey colour. All these boats were a dark grey that may have been as dark as the lower hull grey. A colour shot of U 595 in Danzig in the early months of 1942 shows that this boat had a darkish grey upper colour at that time. Another colour shot, taken in Drontheim in perhaps 1942, shows all of the U-boats with the same dark grey upper colour. The majority of U-boat models have a light grey upper colour, with some painted with a medium grey. But as many photos show, modellers should not shy away from painting their model with a dark grey upper colour.



Above (A7): 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 Type IX second from the left, U 37, looks particularly dark.

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. 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?*).

By the end of the war, **darker colours were more common** than had been the case at the start of the conflict. Indeed, in the latter years these dark greys were certainly more common than the light grey so often used on U-boat models.

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 more rare 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 –

Individual U-boat colour schemes		
Boat	Time period	Colour
U 30	Pre-war	<i>Dunkelgrau 51</i>
	November 1939	<i>Hellgrau 50</i>
	1942 (training flotilla)	<i>Schlickgrau 58</i>
U 35	3 rd November 1936 (com.)	<i>Hellgrau 50</i>
	1937	<i>Dunkelgrau 52</i>

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	5 th February 1938	<i>Dunkelgrau 51 + Spanish Civil War stripes</i>
	17 th June 1938 – October 1939	<i>Dunkelgrau 51</i>
U 37	Pre-war	<i>Dunkelgrau 51</i>
	1942 (training flotilla)	<i>Dunkelgrau 52 or Dunkelgrau 53</i>
U 47	December 1938 – July 1940	<i>Dunkelgrau 51</i>
	August 1940 – March 1941	<i>Schlickgrau 58</i>
U 48	September 1939	<i>Dunkelgrau 51</i>
U 69	19 th September 1940 (launch)	<i>Hellgrau 50</i>
U 73	April 1941	<i>Dunkelgrau 51</i>
U 86	Summer 1942	<i>Dunkelgrau 51</i>
U 94	12 th June 1940 (launch)	<i>Hellgrau 50</i>
	18 th April 1941	<i>Hellgrau 50</i>
	1942	<i>Dunkelgrau 51</i>
U 95	24 th February 1941	<i>Schlickgrau 58</i>
U 96	April 1941, October 1941	<i>Dunkelgrau 51</i>
U 99	Throughout career	<i>Hellgrau 50</i>
U 128	May 1941 (UAK trials)	<i>Hellgrau 50</i>
U 162	August 1942	<i>Dunkelgrau 51</i> upper hull and <i>Hellgrau 50</i> tower
U 163	April/May 1942	<i>Dunkelgrau 51</i>
U 203	4 th January 1941 (com.)	<i>Dunkelgrau 51</i>
U 267	April 1943	<i>Dunkelgrau 51</i>
U 302	Summer 1942 (training)	<i>Dunkelgrau 51</i> upper hull; <i>Dunkelgrau 51</i> on lower half of tower; <i>Schlickgrau 58</i> on upper section with yellow training band
	September 1943	<i>Hellgrau 50</i>
U 335	April/May 1942	<i>Dunkelgrau 51</i>
U 362	30 th July 1944	<i>Weiß 30</i> upper hull and lower half of tower; upper half of tower dark grey
	End of 1944	<i>Weiß 30</i>
U 405	April 1943	<i>Hellgrau 50</i>
U 438	May 1943 (sinking)	<i>Schlickgrau 58</i>
U 441	21 st February 1942 (com.)	<i>Hellgrau 50</i>
	Summer 1942 (5 th U-Flottille)	<i>Hellgrau 50</i> upper hull and <i>Dunkelgrau 51</i> tower
U 442	12 th January 1942 (launching)	<i>Hellgrau 50</i>
U 505	4 th June 1944 (capture)	<i>Dunkelgrau 51</i> upper hull and <i>Blauschwarz 58/2</i> (?) tower
U 552	Throughout operational career	<i>Hellgrau 50</i>
U 558	June 1942	<i>Dunkelgrau 51</i>
U 564	11 th July 1942	<i>Dunkelgrau 51</i>
U 673	Flak-trap	<i>Schlickgrau 58</i> (?)
U 751	Late 1941	<i>Hellgrau 50</i>
U 805	14 th May 1945 (after capture)	<i>Dunkelgrau 51</i> upper hull and <i>Blauschwarz 58/2</i> (?) tower

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

Part V - Camouflage

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.

Above (A8): 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*.

Individual U-boat camouflage schemes		
Boat	Time period	Camouflage scheme
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	13 th November 1941 (sinking of HMS <i>Ark Royal</i>)	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
	28 th 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 23 rd 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	19 th 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	8 th June 1941	14 wavy feather-edged stripes on port side; 13 on starboard side
	21 st 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	30 th May 1941	5 slightly wavy, feather-edged stripes of variable width on starboard side; unknown number on port side
U 561	5 th September 1942	Wide dark band on tower
U 596	1942 or 1943	Mediterranean jagged splotches over tower and upper hull
U 711	30 th July 1944	One thin, very dark wavy line on tower, plus two similar lines on upper hull, over white or light grey



Above (A9): Due to the aesthetic camouflage scheme employed upon U 201 (seen here in Brest in 1941), the boat is a popular choice for model-makers. 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.

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.

A photo in *U-Boot Im Focus* Edition 4 shows the camouflage pattern on the port side of U 307. This consists of a white tower, and two white shapes upon a very dark grey upper hull. The magazine captions suggest that the forward shape was intended to resemble a bow wave. Other Kriegsmarine ships such as the *Bismarck* had a false bow wave so this is very likely to be the case with U 307. The magazine also suggests, quite plausibly, that the white tower and white mid-hull section was shaped like an iceberg. In addition there was a medium grey irregular section on the tower, and the wind deflector flange was very dark grey/black.

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.

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 shorter 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.

Above (A10): 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.

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.

Part VI - Insignia, Tonnage & Tactical 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 -

Individual U-boat insignia	
Boat	Insignia
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 <i>Schnurzl</i>
U 34	Elephant stomping on Churchill’s head
U 46	White outline of snorting bull (U 46’s commander Engelbert Endrass designed this)

	insignia when serving as IWO on U 47)
U 47	White outline of snorting bull (the Bull of Scapa Flow, became 7 th 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 sawfish, created after 3 rd patrol (became 9 th 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 <i>Schnurzl</i> (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 sawfish (9 th U-Flottille insignia)
U 404	Large stylised Viking ship prow (became basis of 6 th U-Flottille and 23 rd U-Flottille)
U 441	Ladybird
U 505	Scallop shell
U 552	Red devil (Erich Topp had commanded U 57)
U 556	Parzival towing battleship <i>Bismarck</i> which it “sponsored”
U 564	Black cat with 3X below (U 564’s commander Reinhard Suhren 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 sawfish insignia became the insignia of the 9th U-Flottille.

The colour of U 96's laughing sawfish is difficult to determine. Red, blue, green and black have all been cited as possible, with white painted around the border. The metal sawfish 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. As it would not make sense for the painted insignia and the metal pennant to have been different colours, then the sawfish 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.

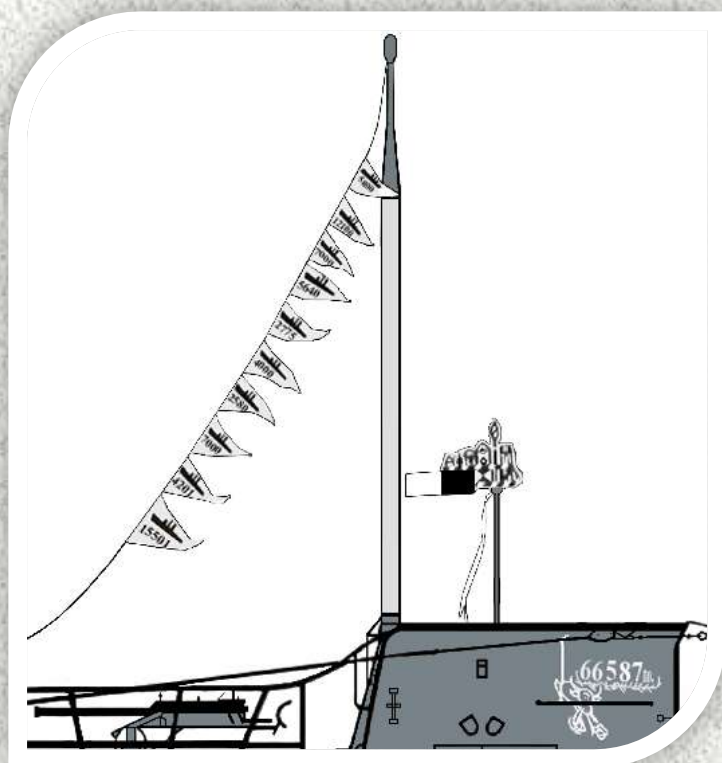
The numerous laughing sawfishes used as 9th U-Flottille insignia may not necessarily have been the same colour as U 96's sawfish, and there may have been variations in colour between these sawfishes. The colour guide in Georg Högel's comprehensive book on insignia indicates blue as the colour of the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

When conning towers were repainted the insignia were often slightly altered. For example, there were at least seven versions of U 47's snorting bull during the 18-month period when it appeared on the boat'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 Arnould 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.



Left: 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.

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.

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.



Left (A11): The yellow band above U 749's spray deflector 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.

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 VII's 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.

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.

Part VII - 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 more rare 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

Above (A12): 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.

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 (A13): 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.

Below (A14): 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 iumping wires of U 405.

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 some cases (such as on U 552 at some point in its career) the inside walls (and periscope bases and UZO) 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.

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

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 various shades of grey.

Periscope bases – The attack periscope base and sky periscope base were usually the upper grey colour. However, in some cases the inside walls, both periscope bases and UZO were painted black or dark grey.

UZO – *Überwasserzieloptik* (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.

D/F 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.



Above (A15): 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 boat to the left – possibly U 61 - is thinner than on the boat to the right.

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.

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 VII's which had this feature tended to have the dark-painted areas around and below the exhaust outlet. On Type II's and IX's this dark-painted area was very common, and was usually painted around and abaft of the exhaust outlet.



Above (A16): 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*.

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.

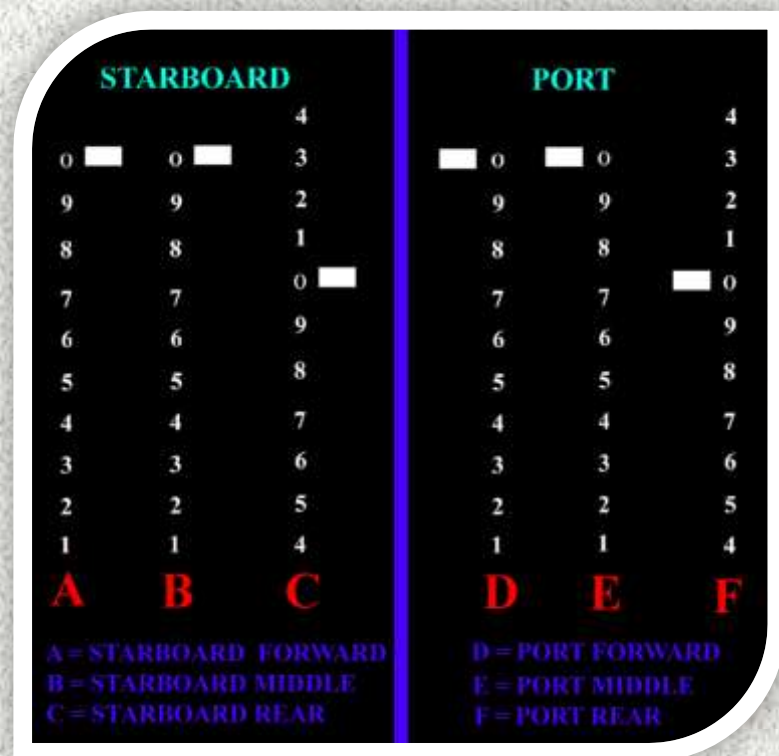
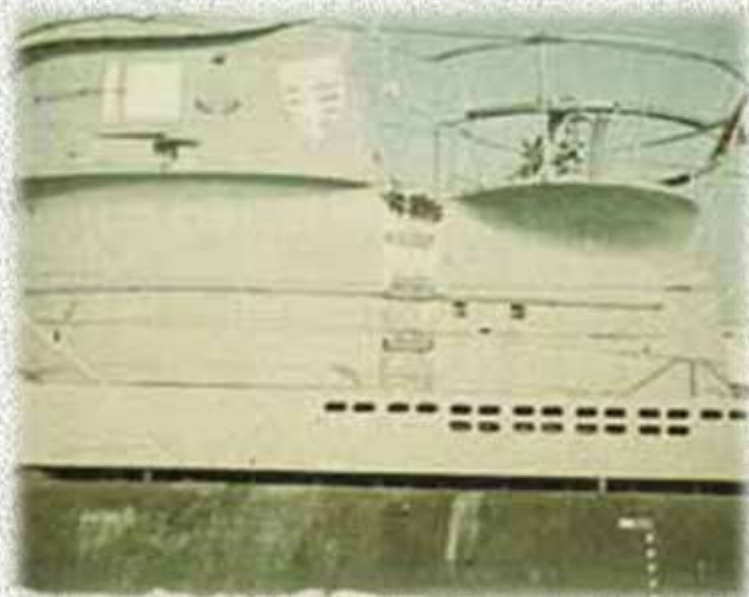
UT (*Unterwasser Telegraphie* - underwater telegraph) – The underwater telephone transducers consisted of two circles above the hydrophones, and two a few feet to the rear of the first pair. There were eight in total - four on each side of the hull. As with the GHG, they were bronze and usually left 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.

Waterline draft markings

Type VIIIs – 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 every 10cm to 1 (0,9,8,7,6,5,4,3,2,1). The third set, at the



Above (A17): 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.

Left: A drawing of the six sets of numerals on Type VIIIs.

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.

Type IXs – On Type IXs there were also six sets of numerals. The top was 0, next to a white rectangle. The numerals ran down from here to another 0, which was on top of a rectangle. There were five more numerals below, running from 9 to 5. This gave a total of 16 numerals on each set.

Type IIs – On Type IIs there were also six sets, with each number having two digits. The front set ran from 44 down to 35, the middle from 40 down to 30, and the rear from 45 down to 35. The interval was 10cm, as on the Type VIIIs and IXs.

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.

Part VIII - 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 deutschen 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 (*Teerfirmis 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 more rare 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.

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.

Right (A18): 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.



Above (A19): The wooden deck colour can be seen on the U-boats in the foreground of this 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.

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.

Part IX - Weathering

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.

Weathering above the waterline

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 (A20): 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.

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 slippery, and presents a hazard to crewmen who might lose 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. 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.



Above (A21): 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.



Above (A22): 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 ship models, many modellers neglect the plantlife that builds up on the lower hulls of vessels.

Below (A23): 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.

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 $\frac{1}{4}$ to $\frac{3}{4}$ 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 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.

Part X - Interior & Summary

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.

Part XI – Acknowledgements & Useful Links

Acknowledgements

I would specifically like to thank David E. Brown, Falk Pletscher, Hans Mair, Jeff LaRue, John Snyder and Randy Short of Snyder & Short Enterprises, Dr. Helmut Wigger of the RAL Institute, Pat Crowley, Sam Reichart and Rainer Bruns for their assistance in matters pertaining to this article. I am also grateful to all the modellers and enthusiasts who offered their advice in a series of highly informative discussions.

Useful links

Articles dealing with the colours used upon German naval vessels can be found at –
<http://smmlonline.com/articles/kriegsmarinecamo/kriegsmarine.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.

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

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>

Colour reference charts can be found at –
<http://www.ipmsstockholm.org/colorcharts/colorcharts.asp>

Type VIIC Free-Flooding Vent Patterns

Contents

- ⊕ Part I Introduction
- ⊕ Part II Free-Flooding Vents
- ⊕ Part III U-Brass Set
- ⊕ Part IV Central Drainage Area
- ⊕ Part V Type VII U-Boat Batches

Part I – Introduction

Revell's 1/72nd Type VIIC U-boat model kit has become a very popular choice in the modelling community. Many modellers have spent numerous dollars forking out for some of the after-market upgrade kits that increase the accuracy of this kit. While valuable time and money is spent on buying and fitting these upgrade kits, modifying the inaccuracies in the free-flooding vents in the Revell kit is very often overlooked. Some of the vents on the kit are missing, some are too large, while others are rectangular when they should be oval.

The purpose of this article is to provide details of all the free-flooding vents that were present in the hull casing of Type VIIC U-boats so that super-detailers of the Revell kit may modify their kits accordingly. The article may also be useful for modellers building OTW's 1/32nd Type VIIC, since all of the vents have to be drilled out of the GRP hull when constructing this kit. Details of the vent patterns of VIIBs are also included for modellers building the older Revell 1/125th U 47 or U 99 kits.

Included towards the end are details of the U-Brass photo-etch upgrade set. The set was designed to be used along with the original version of this article to allow modellers to correct the free-flooding inaccuracies in the Revell kit.

This version of the article is updated from the original. The original was published in the September 2005 (#62) issue of the Subcommittee Report.

Part II – Free-Flooding Vents

Variations in vent patterns

Type VII U-boats had a watertight pressure hull which was visible along the central areas of the hull. Forward and aft of this pressure hull were non-watertight structures built of thinner steel. Known as the hull casing, these structures were flat on top to permit movement by the crew, and suitably shaped along the sides to allow for hydrodynamic streamlining. To make the hull casing free-flooding, the thin steel was punctured with numerous free-flooding vents (also called drainage holes) that allowed water to drain in and out of the spaces between the pressure hull and the inside of the hull casing. Since the water

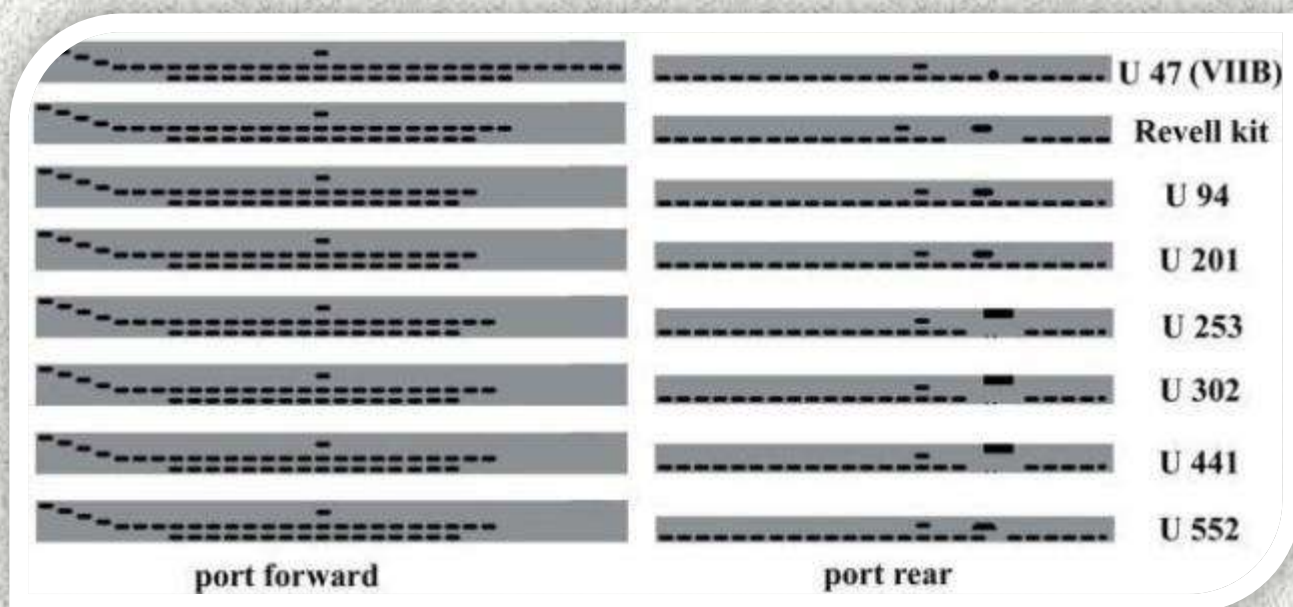
on the inside of the casing was at the same pressure as the water on the outside of the casing, the thin steel of the casing would not cave in no matter what depth the boat was at.

The free-flooding vents on the hull casing of the original VIIs (VIAs) and VIIFs were markedly different from the VIIBs and VIICs. As VIAs and VIIFs are rarely modelled, their patterns are not covered in this article. The vent patterns on the 24 VIIBs, 574 VIICs and 88 VIIC/41s were reasonably similar. But a number of variations did exist, primarily between boats that were built in different shipyards. There were also differences between boats that originated from different batches within each shipyard. Though much less common, there were even minor differences between boats from the same batch. Differences were also present between early and late boats, particularly with regard to the diesel exhaust outlet. These small but distinctive variations in the free-flooding vents act as footprints that can sometimes help us establish the rough time period in which a photo of a U-boat was taken. Occasionally the patterns can identify the shipyard from which the boat originated.

The constant modifications that were being made to VIICs, plus the differences in vent patterns between boats, mean that the modeller who is building a detailed model of a Type VIIC U-boat to a highly accurate standard should select a particular boat at a particular time in its career. To facilitate this accuracy, a number of photos of the chosen U-boat should be sought by the modeller.

Main free-flooding vent patterns

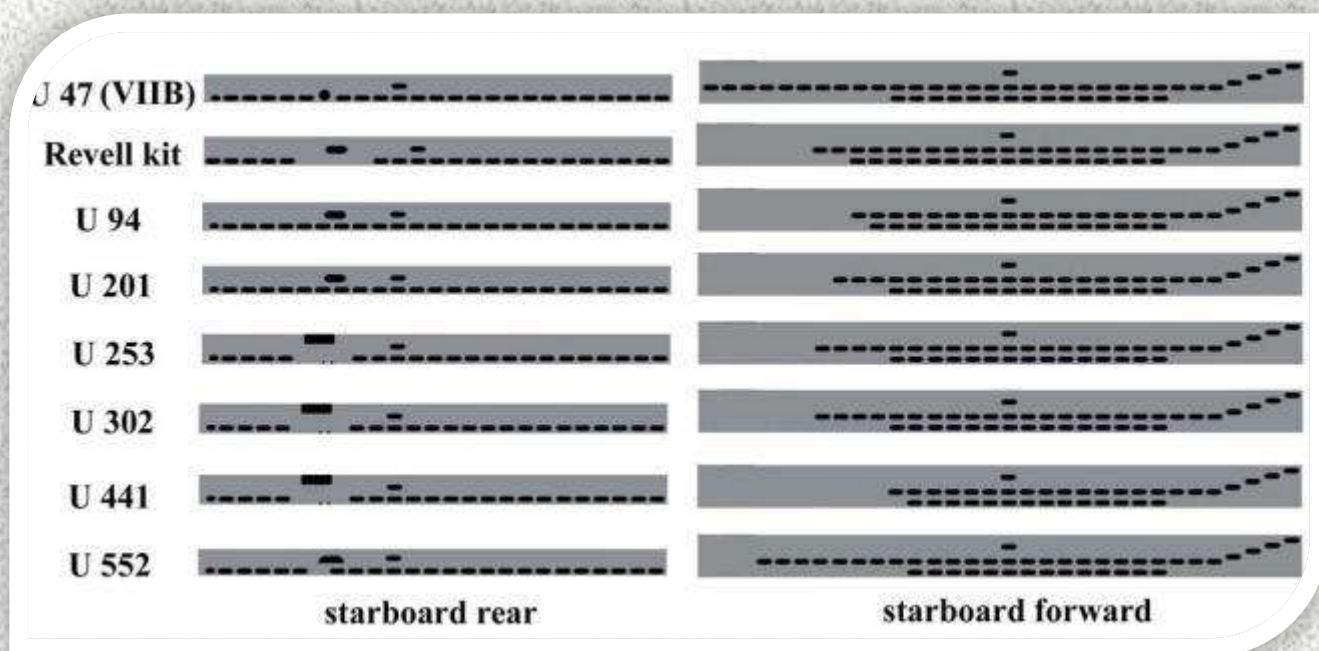
The two main groups of vents ran along much of the length of the boat, just below the top of the hull casing. One group of large-sized vents was located forward of the central drainage area (the area directly



above the saddle tanks) and the other was located aft of the central drainage area. When a U-boat surfaced, water would pour out of these vents.

In the drawings below I have replicated the vent patterns of these main groups for several U-boats. My primary reason for selecting these boats was that I had enough photos of them to identify all the vents. As several photos from different angles are required, it can often be difficult to ascertain the vent patterns on a particular boat.

Above: The port side of the main groups of free-flooding vents for six VIICs, one VIIB and the Revell kit.



Note that even although U 94 and U 201 were both built at the *Friedrich Krupp Germaniawerft A.G.* shipyards in Kiel, there were still small differences in their vent patterns.

In the image above, the vents located forward of the central drainage area on the starboard side of U 552 can be seen. The 25 vents on the top row of the starboard side extended farther aft towards the central drainage area than on many other VIICs. I have also seen these extra vents on the starboard side of U 132, U 331, U 564, U 565, U 566, U 570 and U 751. All these boats had the same number of vents on the lower row as U 552 (14 vents), except for U 373 (12 vents) and U 751 (16 vents). I have also seen these extra vents on the starboard side on two unidentified boats built at the *Kieler Howaltswerken* shipyards in Kiel. As U 392 did not have them, these extra vents were not present on all *Kieler Howaltswerken* boats. Since these extra vents featured on boats from several different shipyards, and these shipyards produced boats without the extra vents, we cannot, unfortunately, specify that they were particular to one shipyard.

It can be seen from the drawings that the VIIB U 47 had even more vents directly ahead of the central drainage area (28 vents on the top row). These extra vents, present on both starboard and port sides of all VIIBs, are a characteristic of the VIIB that can be used to identify a VIIB from a VIIC.

By comparing the Revell vent patterns with the VIIC vent patterns, it becomes obvious that alterations should be made to the kit. In fact, the main groups on the Revell kit are not accurate for **any** VIIC. In the main four vent groups alone, 11 vents need to be drilled, 7 filled and 2 altered if U 552 is being depicted. A similar number is required for U 94: 10 drilled, 8 filled and 2 altered. In my opinion, Revell should have included the maximum number of vents for each group so that no drilling would have been required. Although this pattern would not have been accurate for any particular boat, it would have been a simple matter to fill in the necessary vents for the chosen boat.

The earliest VIICs had an unbroken line of 25 vents in the rear groups. When modelling these boats, four extra vents per side should be drilled out beneath the diesel exhaust outlets. Also in the rear groups is a vent located above the line of vents, just forward of the exhaust outlet. In the Revell kit this vent has been positioned above the wrong vent; it should be located one vent farther towards the stern. The vent at the rear of the rear group in the Revell kit is an oval hole that is the same as the rest of the vents. However, this rearmost vent was actually different in shape to the rest. It was the same height, but far narrower in width. In fact, it was almost circular in shape.

Above: The starboard side of the main groups of free-flooding vents. Wohlfarth's U 556 and Suhren's U 564 both had the same vent patterns as U 552.

Type VIIC Free-Flooding Vent Patterns

Except for the boats which had the extra vents on the starboard side, no drilling of the forward groups of the Revell kit is necessary. The vent patterns for the rest of the boats can easily be replicated by filling in the necessary vents.

The following is a partial listing of which boats had which patterns on the forward hull casing. This information has been derived from assessment of period photos. T designates the number of vents on the top row, B the bottom row.

Forward vents, port side	
Pattern	Boats
T18/B14	U 719, 754
T20/B10	U 929
T20/B14	U 617
T20/B16	U 69, 94, 95, 96, 97, 201, 205, 357, 673, 1305
T20/B16*	U 373 (vent 13 on the bottom row – counting from the farthest forward vent – had two circles rather than an oval vent)
T21/B14	U 617, 752
T21/B16	U 81, 89, 251, 253, 254, 302, 313, 334, 354, 373, 405, 407, 410, 437, 441, 443, 551, 553, 559, 573, 582, 593, 596, 617, 821, 1058, 1109, 1192, 1197
T21/B17	U 213 (VIID)
T28/B15	U 99 (VIIB)
T28/B19	U 45, 46, 47, 48, 51, 100 (all VIIBs)

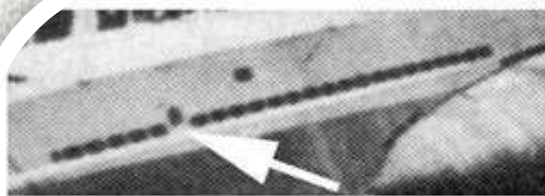
Forward vents, starboard side	
Pattern	Boats
T18/B13	U 1171 (vent missing on bottom row beneath the 4 th vent)
T18/B14	U 352, 412, 441, 471, 977, 1165
T19/B14	U 270 (missing 1 st two vents on top row)
T20/B14	U 377
T20/B16	U 94
T21/B12+1	U 930 (extra vent above bottom row, in line with the 2 nd vent on the top row)
T21/B14	U 70, 96, 98, 250, 315, 351, 364, 402, 404, 415, 427, 617, 739, 744, 752
T21/B15	U 93, 201, 207, 211
T22/B12	U 373 (the 22 vents were in the positions for 25 vent. Counting back from the farthest forward vent, the 19 th , 21 st and 22 nd vents are missing)
T22/B15	U 253, 302
T22/B16	U 218 (VIID)
T24/B14	U 372 (vent 13 on the bottom row – counting back from the farthest forward vent – had two circles rather than an oval vent)
T25/B14	U 132, 331, 451, 552, 556, 570
T25/B16	U 81
T28/B15	U 45, 47, 48, 49, 51, 73, 74, 75, 83, 99 (all VIIBs)

When modelling a boat not listed above, refer to the VIIC batches at the end of the article. Then choose the closest U-number that was built in the same batch, or failing that the closest U-number in the same shipyard. The pattern may be similar or even identical.

Diesel exhaust outlets

Type VIIs had two diesel exhaust outlets, located on either side of the hull casing, usually above the line of vents in the rear main group. As the war progressed, the design of these outlets changed. New boats were fitted with the latest style, while boats that were in service were modified with the latest style during refits.

The earliest style (which I have called style 1) was a circular outlet located along the line of vents in the main rear group. This style featured on the early VIIBs in the batches U 45 to U 55 and U 99 to U 102, but not on the VIIBs from other batches or any VIICs. These round outlets were modified on famous VIIBs such as U 47, U 48, U 99 and U 100 to the original VIIC oval outlet (style 2). Style 2, the style in the Revell kit, has a large oval hole above the line of vents.



STYLE 1
VIIB only
U 99
12th March 1940



STYLE 2
U 93
8th June 1940



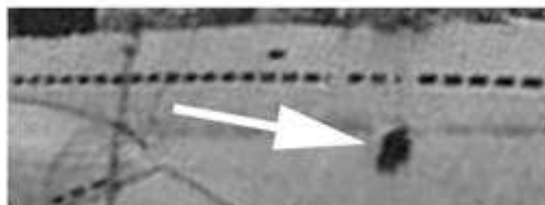
STYLE 3
U 552
(shrouded)



STYLE 4
U 442
12th January 1942



STYLE 5
U 1003
December 1943



STYLE 6
Late war

Above (B1a-B1f): The holes pointed to with arrows are not free-flooding vents but one of the two diesel exhaust outlets. At least four styles of exhaust outlet can be seen in photos of VIICs.

Other VIIBs such as U 73 were launched with style 2, and never had the round outlet (style 1) that was standard on the earliest VIIBs. All early VIICs such as U 69, U 94, U 96, U 201, U 332, U 352, U 402, U 552, U 556, U 564, U 581, U 617 and U 651 had style 2.

On some U-boats, such as U 87, U 96 and U 552, a shroud (style 3) was added over style 2 at some stage in their careers. The shroud directed the exhaust gases downward so that the boat would be rendered less visually detectable. There were differences in the shroud designs. In 1942, U 751 had a shroud over the outlet, plus two holes beneath the shroud.

Then, at some stage beginning in late 1941 or so, boats coming down the slipways sported a new style of exhaust outlet. This outlet (style 4), which featured upon U 209, U 227, U 253, U 302, U 441 and U 704, had an almost rectangular shape with two squares below. This style was ordered on the 6th December 1940 but it would be a number of months until it was implemented. The late VIIBs U 83 and U 86 also sported style 4. A lip was added at the top of some style 4 outlets to keep the exhaust smoke from rising up.

In 1942 another exhaust outlet (style 5) was introduced. This style had two horizontal bars positioned at an angle that directed the exhaust gases downwards. Style 5 featured on U 226 when it was launched on the 18th June 1942. It is likely that by the autumn of 1942 all new U-boats launched had style 5. Subsequent U-boats, including U 241, U 995, U 1003 and U 1305 sported this last style of outlet.

By the late stages of the war, Allied aircraft were forcing U-boats to spend most of the time underwater. This was the opposite to the start of the war, when they had spent most of the time on the surface. Since so much time was spent underwater, it was no longer necessary to keep the exhaust outlet above the waterline. The last style of outlet (style 6) was introduced below the waterline. Now that the outlet was lower down, well below the line of free-flooding vents, more vents could be added. There was now an almost a complete line of vents on the aft casing.

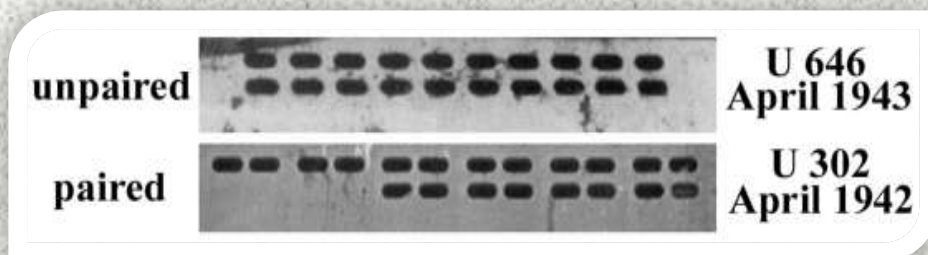
It is important to remember that some boats had different styles of outlet at different times. For example, U 203 was retrofitted with style 4 at some stage prior to April 1943, having originally had style 2 when launched.

Medium-sized vents above central drainage area

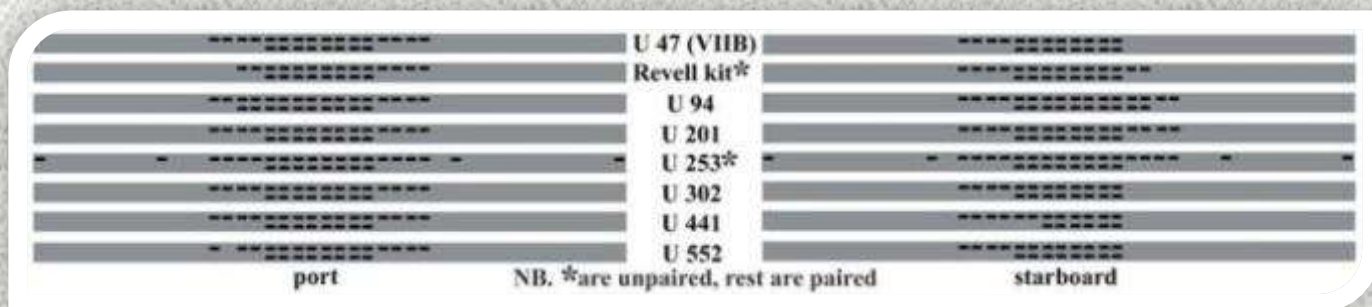
It was commonplace for the medium-sized vents located above the large central drainage area (above the saddle tanks) in the early boats to have been arranged in pairs. The early VIIC style of paired vents was changed at some stage to a later style in which these medium-sized vents were evenly spaced apart (unpaired).



Above (B2): There are always exceptions and peculiarities in regard to the Type VII. As pointed out by Bill Gordon, the Type VIIB U 73 had a different outlet when the boat served in La Spezia. This consisted of a shroud over the style 4 outlet.



Left (B3a & B3b): A comparison between paired and unpaired vent patterns.



Above: The medium-sized vents above the central drainage area were rarely the same on port and starboard sides. There were usually fewer on the starboard side.

There were some boats which had 4 extra single medium-sized vents on the port side and 4 extra single medium-sized vents on the starboard side. The U-boats which sported this pattern include U-numbers 74, 80, 81, 82, 83, 132, 136, 202, 251, 253, 267, 269, 275 and 278. As all these boats were built in the *Bremer Vulkan-Vegesacker Werft* shipyard in Vegesack, this pattern appears to be particular to boats built in this shipyard. The medium-sized vents on the U-boats from Vegesack were evenly spaced apart (unpaired). This was unusual for U-boats built at the start of the war, since all the boats from other shipyards had these vents arranged in pairs.

There are always exceptions in relation to the vent patterns. For example, on the top row of the forward pattern on U 390 the 11th vent back was missing. Similarly, on the top row of the forward pattern on U 442 the 14th vent back was missing.

There are a few vents missing in this area of the Revell kit. Should U 94 be chosen as a subject, 8 vents have to be drilled. As with the main groups, it would have been more prudent of Revell to have chosen a pattern which had the maximum number of vents, for it is always easier to fill than drill.

The Revell model has the medium-sized vents evenly spaced apart, as was the norm on the mid-to-late war VIICs. This is good news for those modellers who are converting their Revell kit into a mid-to-late war boat, or building a U-boat that originated from the *Bremer Vulkan-Vegesacker Werft* shipyards. However, it is not such good news for those of us who wish to make an early VIIC, which the kit is meant to depict. To accurately model an early VIIC, the unpaired (evenly spaced apart) pattern on the kit should be altered to the pattern in which the vents are arranged in pairs. This is not the easiest of tasks, and one which many modellers would prefer not to have to undertake.

The following is a partial listing of which boats had which patterns above the saddle tanks. This information has been derived from assessment of period photos. T designates the number of vents on the top row, B the bottom row. Type VIIBs and VIIDs are included in the list.

Medium vents above saddle tanks, port side	
Pattern	Boats
T13/B8	U 239
T13/B10	U 249, 978, 1064
T14/B10*	U 673 (*evenly spaced)
T15/B8	U 432, 552, 559, 571, 575, 595, 596, 612, 617, 628
T16/T8*	U 97, 707 (*evenly spaced)
T16/T8	U 47, 52, 69, 71, 74, 86, 87, 101, 201, 202, 203, 204, 212, 213, 226, 227, 302, 332, 333, 354, 357, 437, 654, 659, 755 (all paired. Note that the vents on U 69 were unevenly distributed)
T16/B10	U 93, 94
T17/B8*	U 81, 83, 132, 202, 251, 252, 402 (*evenly spaced. These are the <i>Bremer</i>

Vulkan-Vegesacker boats with the extra 4 vents)

Medium vents above saddle tanks, starboard side

Pattern	Boats
T9/B9*	U 427 (*evenly spaced)
T10/B10*	U 249, 646, 977, 995 (*evenly spaced)
T12/B6	U 441
T12/B8	U 46, 47, 48, 52, 53, 73, 302, 331, 352, 353, 354, 392, 404, 408, 552, 566, 651, 701, 739
T16/B8	U 71, 203, 213, 375, 208
T16/B10	U 93, 94, 201
T17/B8	U 302
T20/B8*	U 74, 81, 132, 136, 253 (*evenly spaced. These are the <i>Bremer Vulkan-Vegesacker</i> boats with the extra 4 vents)

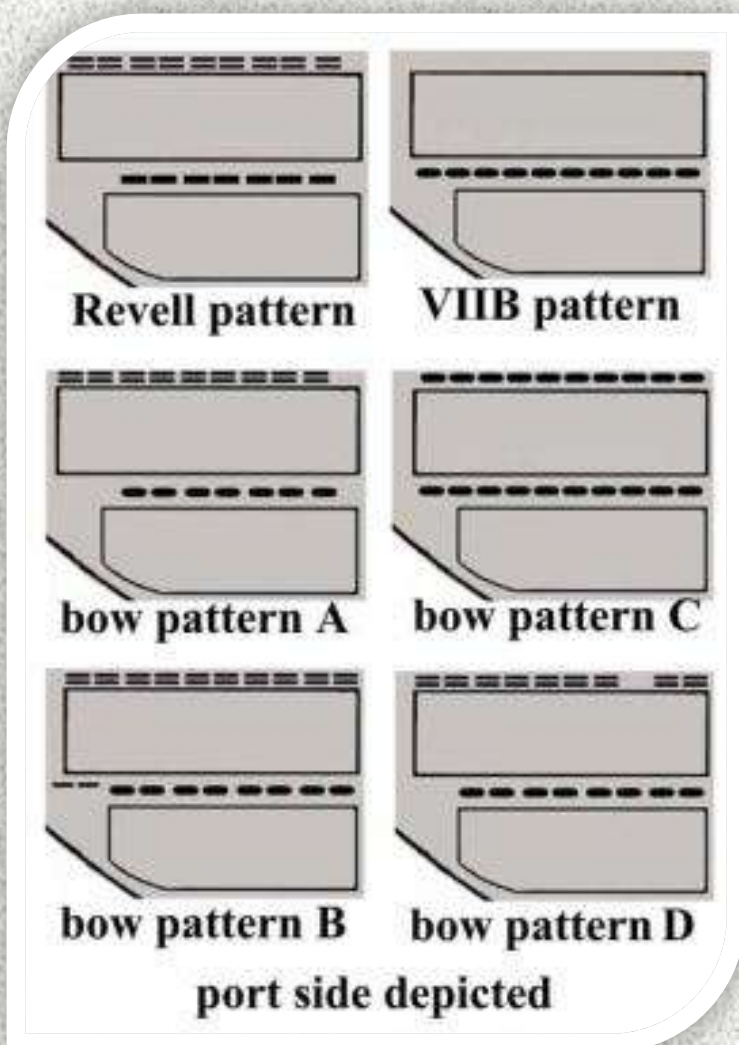
Vents near torpedo doors

Type VIICs had a row of vents between the torpedo doors, plus a double row of smaller elongated vents above the upper doors. Since most photos of VIICs were taken of the U-boats in the water, this area is most often hidden from view. As such, it often proves difficult to ascertain which bow vent pattern featured on a particular boat.

U 228 and U 1064 had the arrangement that I have called “bow pattern A.” This pattern had seven paired medium-sized vents between the doors and nine double rows of paired elongated vents above the upper doors. It is likely that all the boats which were built in the same batches as U 228 and U 1064 also had pattern A. Both of these boats were built at the *Friedrich Krupp Germaniawerft A.G.* shipyards in Kiel.

A higher percentage of U-boats had the arrangement that I have called “bow pattern B,” with eight paired medium-sized vents between the doors and ten double rows of paired elongated vents above the upper doors. The boats included U-numbers 69, 94, 333, 407, 441, 451, 458, 471, 551, 559 and 703. Some had the additional two elongated vents towards the stem, whereas some did not.

A much rarer pattern, bow pattern C, consisted of ten unpaired medium-sized vents between the doors and ten unpaired medium-sized vents above the upper doors. I have



Above: This drawing illustrates the differences in the vent patterns near the port torpedo doors. The starboard vent patterns were the mirror image of the port vent patterns.

seen this pattern only once, in a photo of a VIIC dry-docked in Samalis in 1942.

Bow pattern D is also a rare pattern, which was found on U 929.

The early Type VIIBs had ten unpaired medium-sized vents between the doors (as in bow pattern C) but none above the upper doors. I have not seen any photos of late VIIBs in which this area of the hull casing is exposed, so I cannot say which pattern was present on the late VIIBs.

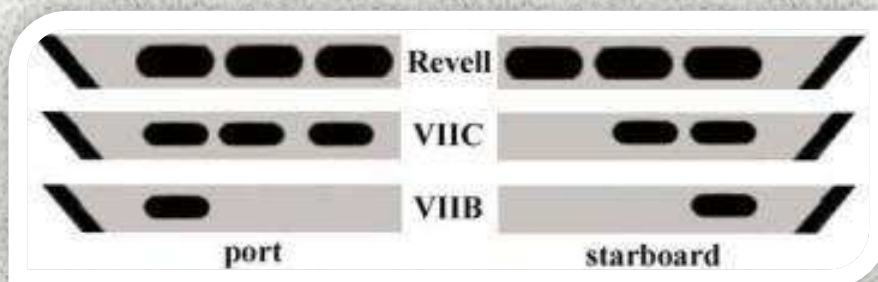
Bow pattern A is the pattern depicted in the Revell kit. As many popular subjects such as U 69, U 96, U 201 and U 552 all had pattern B, an extra six vents need to be drilled for these boats. Accuracy in this area becomes ever more difficult when it is realised that the torpedo doors are too long in the Revell kit. In fact the upper torpedo doors are **a full 7mm** too long in length. By shortening the doors to their correct length, the line of vents then appear too long in length also.

Many modellers will consider these inaccuracies to be of no major concern. What they might be more concerned about in the Revell kit is the basic shape of the vents in this area. The vents were all oval in shape, but for some reason they are rectangular on the Revell kit.

Two/three vents next to stem

The medium-sized vents right next to the stem, above the level of the upper torpedo doors, are too large in size in the Revell kit. On the majority of VIICs there were three vents to port and two to starboard, rather than the three per side which feature on the Revell kit. Note also that the third vent from the stem on the port side was offset slightly from the second vent. Early Type VIIBs had only one vent next to the stem rather than the two/three that were present on VIICs. I have not seen any photos of late VIIBs in which this area of the hull casing is exposed, so I cannot say which pattern was present on the late VIIBs.

Right: The oval vents right next to the stem, above the level of the upper torpedo doors.

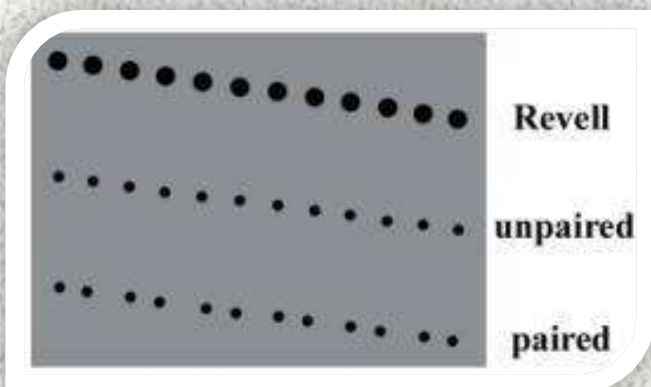


Twelve circular vents above torpedo doors

On each side of the hull, there were a line of twelve small circular vents located well above the upper torpedo door. Most U-boats had these vents arranged with an even space between them (unpaired). This unpaired pattern is the style present in the Revell kit.

A smaller proportion of U-boats had these vents arranged in pairs. The paired arrangement featured in *Blohm & Voss* boats such as U 552, U 556 and U 564. Should any of these boats be chosen as a subject, this line of vents on the Revell kit should be altered to a paired pattern.

One of the most noticeable inaccuracies in the Revell kit is that these twelve vents are **much** too large in the Revell kit. Since the line



Left: The difference in diameter between the circular vents on VIICs and the large vents in the Revell kit is obvious.

of vents is also too far forward in the Revell kit, it is easy enough to rectify both these problems: simply fill in the holes in the kit and drill new and smaller ones just aft of each of the filled holes.

Curved line of vents above central drainage area

The VIIBs and the earliest VIICs originally featured breakwaters (Revell parts 115 and 116) on the hull casing above the forward part of the central drainage area. These breakwaters were positioned outboard of the 88mm deck gun to help reduce the interference to the gun crew from waves. An order to remove

the breakwaters was issued on the 29th May 1941. However, a few boats such as U 96 had the breakwaters removed earlier than this date.

The breakwaters were replaced by a curved line of small circular vents of varying size. These vents allowed for a marginal improvement in diving times. Sometimes the vents in the curved line were evenly spaced (unpaired), as in the Revell kit, but more often the vents were arranged in pairs.



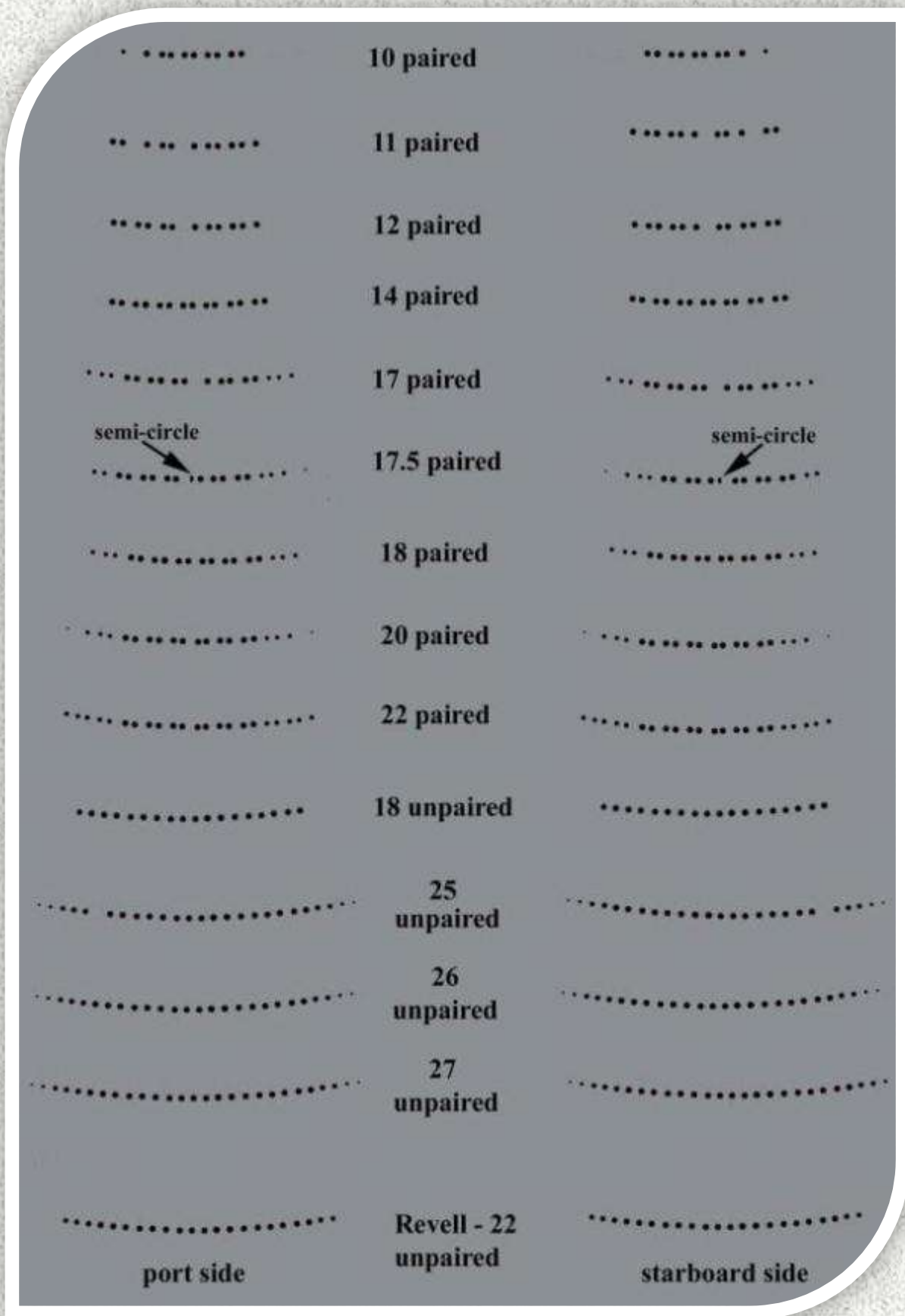
Left (B4): The curved line of vents on the port side of U 82. Note that the 17 vents are arranged in pairs.

Below is a short listing of which boats had which patterns -

Curved line patterns	
Pattern	Boats
10 paired	U 570
11 paired	U 75
12 paired	U 74
14 paired	U 83
17 paired	U 81, U 82, U 202, U 251, U 253, U 254, U 451, U 559 and U 565
17 paired plus semi	U 552 (different to normal 17 paired pattern)
18 paired	U 89, U 132, U 302, U 303, U 331, U 373 and U 404
20 paired	U 564
22 paired	U 377
18 unpaired	U 392 and U 402
25 unpaired	U 204
26 unpaired	U 94, U 96, U 201 and U 202
27 unpaired	U 93

The Revell kit has 22 evenly-spaced (unpaired) vents, so four extra small holes need to be drilled on each side to replicate the 26 unpaired pattern. The paired patterns require more drilling and filling.

By December 1941 the policy of drilling extra vents in this area was discontinued. Every boat launched during December 1941 (and some before this date) did not have the curved lines. U 226, U 239, U 267, U 302, U 357, U 404, U 412, U 441, U995 and U 1064 are all examples of boats which never had these lines. The curved lines were gradually removed in operational boats over a period of time. There were even some early U-boats such as U 203 and U 571 which didn't have the curved lines, even when other boats did.

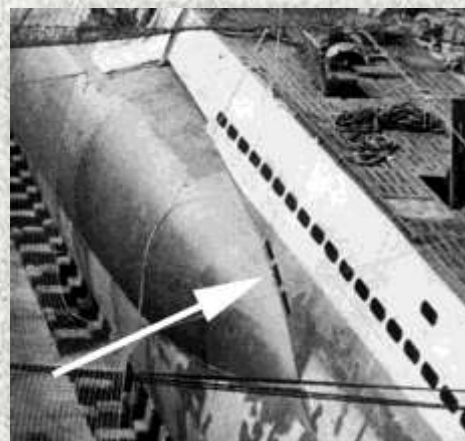


Above: Several different curved line patterns were present above the central drainage area of VIICs.

Three vents at rear of saddle tanks

The three elongated vents on the hull casing next to, and very slightly above, the rear of the saddle tanks are missing from the Revell kit.

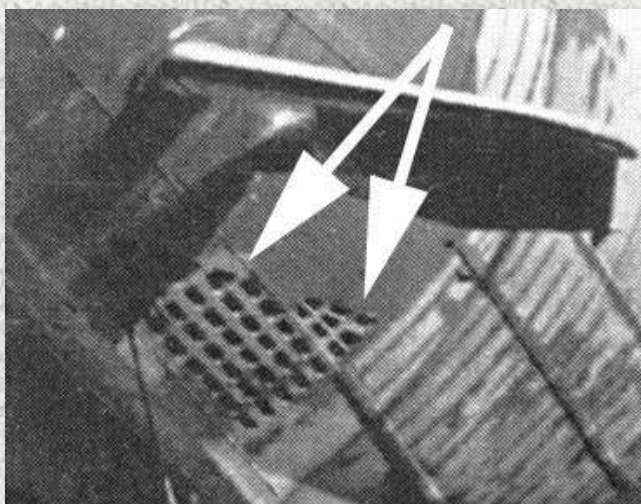
Right (B5): The three vents immediately beside the saddle tanks were more elongated in shape than the main vents above.



Vents behind forward hydroplanes

There are very few clear photos in books of the pattern of vents behind the forward hydroplanes, nor are there side profiles or drawings which can be relied upon. What can be established from these few photos is that the pattern is a little too simplified in the Revell kit and, more importantly, the vents in the kit are rectangular when they should be oval in shape.

The photo-etched upgrade set from Modelbrass includes parts to replace this area of the Revell kit. The pattern in the set resembles the shape and pattern found in the museum VIIC/41 U 995. An extra group of 7 vents (slightly offset from the main group) were not a feature of U 995. This extra group needs to be filled in if U 995 were to be modelled. It is possible that all late U-boats did not have this extra group.



Above left (B6): The right hand arrow on this photo of the VIIB U 99 points to a small group of vents that were present in some VIICs, but not in others. Above and forward of the vents are the port hydroplane and its guard.

Above right (B7): The area behind the forward hydroplanes can be greatly improved with the Modelbrass set, fitted to the author's model in this photo.

Vents near rear hydroplanes

As with many of the vents in the Revell kit, the vents behind the rear hydroplanes are also rectangular when they should be oval in shape. The pattern of vents in the Revell kit is also too basic.

Photos which show the pattern of small vents near the rear hydroplanes are even rarer than the group behind the forward hydroplanes. Due to the scarcity of photographic material, the pattern visible in photos of the museum VIIC/41 U-boat U 995 was used for the Modelbrass set.



Left (B8): By comparing this photo with the Revell kit, it becomes apparent that the vents in front of the port propeller were more numerous, and different in shape, to those in the model kit. The perforated plates may be sacrificial anodes (thanks to AMP forum member Pat).

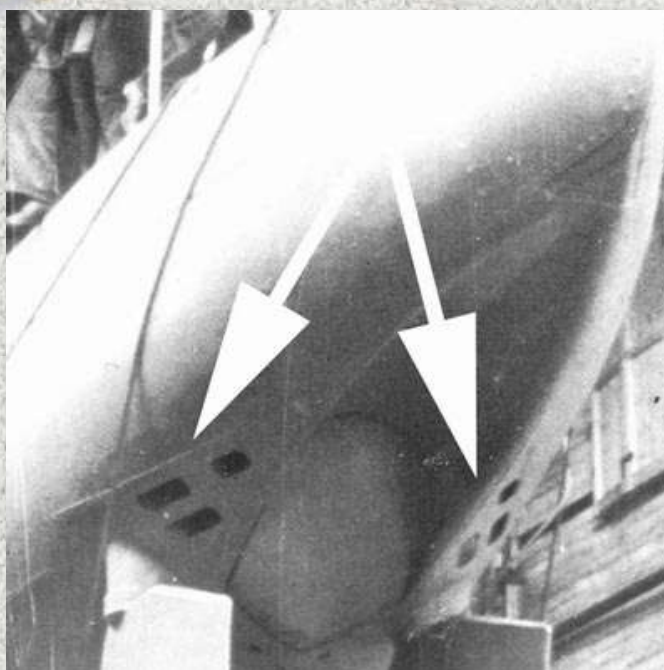
Below left (B9): Although tricky to fit, the Modelbrass set greatly improves the pattern of vents behind the rear hydroplanes.



Vents aft of the rudders

The two sets of three vents immediately aft of the rudders are reasonably accurate in the Revell kit.

Right (B10): Between the two sets of three vents is the aft torpedo door.



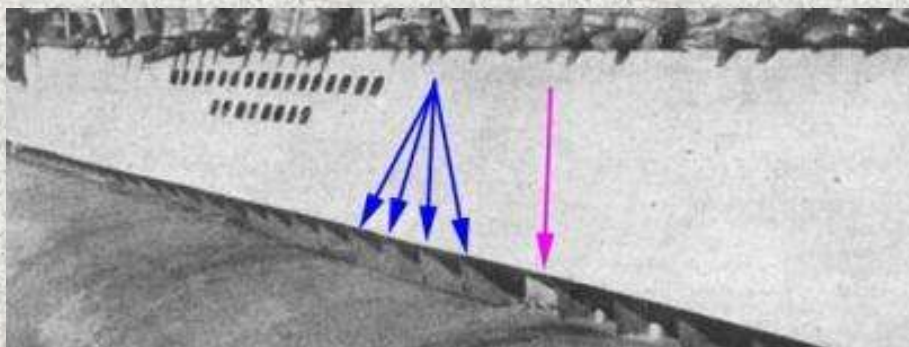
Part III - Central Drainage Area

While it is not essential to drill out the central drainage area, some modellers have chosen to do so. The hull casing above the central drainage area becomes much weaker as a result, so great care is needed when handling a hull piece that has had this area drilled out.

U-boats had ribs which were spaced at regular 60cm intervals. These ribs could be seen in the central drainage area if viewed from a suitable angle. By adding vertical strips to represent these ribs, the hull casing above the central drainage area becomes much less prone to damage. In addition to the ribs were four thicker supports (two on each side).

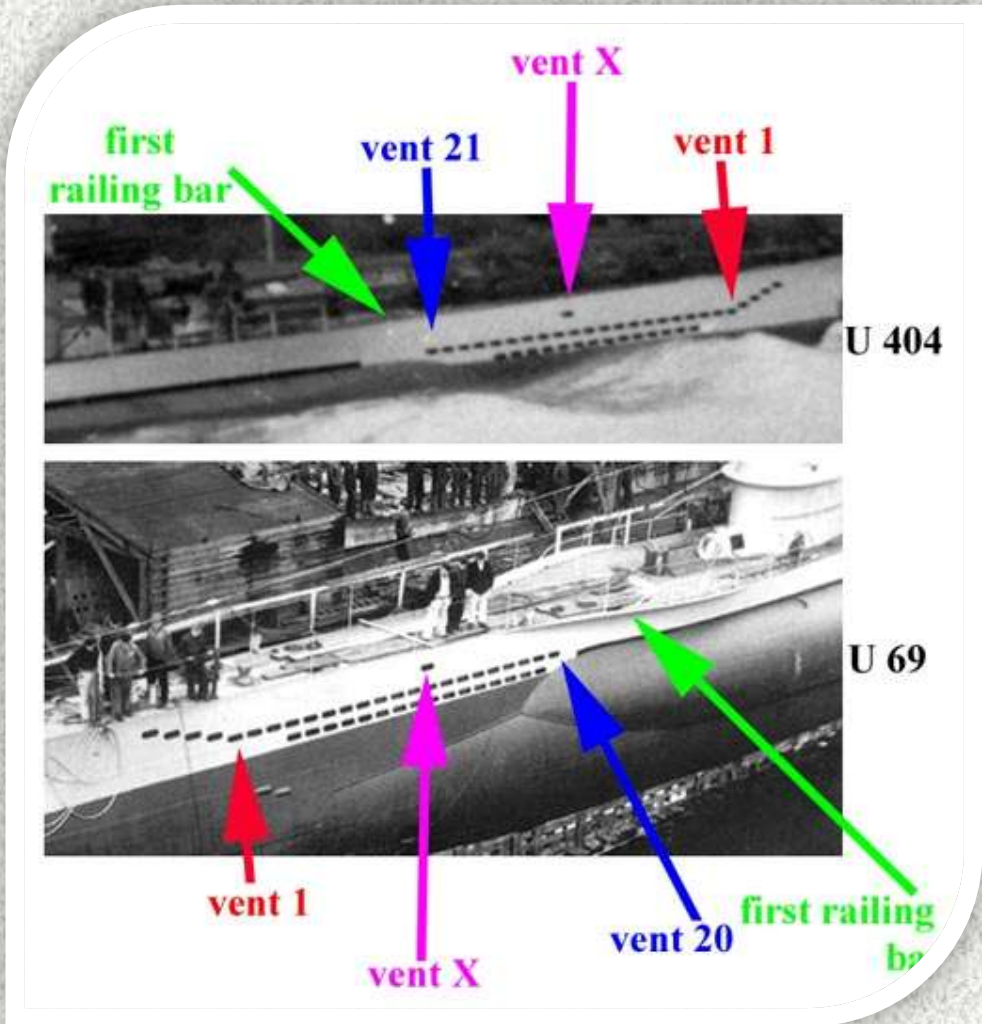
One aspect of the VIIC that is rarely discussed is the different lengths of the central drainage area on either side. The central drainage area on the port side was actually shorter in length than on the starboard side. While this does seem strange, assessment of period photos show this to be true. Once one has appreciated the different lengths, it then becomes very obvious when looking again at photos.

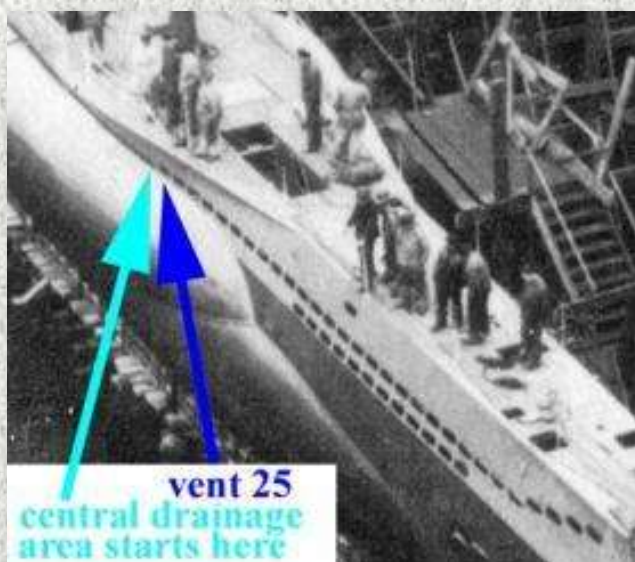
We will first look at the starboard side in the image below. If we go to the top row, then count back from the farthest



Above (B11): The blue arrows point to the thin ribs while the magenta arrow points to one of the two thick round supports on either side.

Below (B12a & B12b): A comparison between the front end of the central drainage area on port and starboard sides.





Left (B13): Some VIICs such as U 373 above had 25 vents on the top row on the starboard side.

forward vent, we count 21 vents. Vent X is the single vent above the top row, and was above the 12th vent from the front. We can plainly see that the central drainage area begins a good distance behind vent 21. The green arrow points to the very front of the deck railings. The front of the railings is located behind vent 21 and **forward** of the front of the central drainage area.

Now we look at the image above, which shows the port side of U 69. There are 20 vents on the top row. The front of the central drainage area starts not far behind vent 20. In fact it starts just behind

where vent 21 would have been. The VIICs had a maximum of 21 vents on the top row. The start of the drainage area always started just behind vent 21, or where vent 21 would have been in the case of the boats with 18 or 20 vents. The green arrow points to the front of the deck railings. We can see it is well behind the start of the central drainage area.

A number of VIICs had 25 vents on the top row on the starboard side. The central drainage area started directly behind vent 25, as can be seen above. In fact, the central area on the starboard side **always started at this same location**, regardless of the number of vents. On boats with 21 vents, if we count back to where the 25th vent would have been, the central area starts directly behind this point.

The four vents that were arranged diagonally were at the same location on the port and starboard sides, as was vent X. So vent 21 on the port side was directly opposite vent 21 on the starboard. The rear of the central area started at the same location on port and starboard sides. The central drainage area **always** started just behind vent 21 on the port side, and just behind vent 25 on the starboard side. Given the above facts, we are faced with an obvious conclusion –

- the central drainage area was shorter on the starboard side
- the front end of the central drainage area began farther back on the starboard side than on the port side

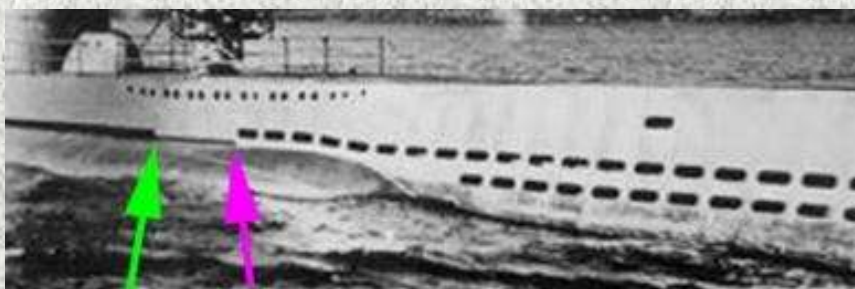
For those who still cannot accept this, look at the position of the front bar of the deck railings. The starboard and port deck railings were positioned at the same position on either side of the deck, giving ideal reference points. On the starboard side the bar is ahead of the central area, while on the port side the bar is well behind the start of the central area.

Once we understand the different central area lengths, it becomes obvious in all photos. Now we can often see the difference without needing to count vents or look at the deck railings.

But how wide was the length difference between either side? The distance equates to four vent widths. On the Revell kit this is 28mm, giving a real difference in length of around 2 metres. The Revell kit is completely wrong in this respect, with the central area starting 5mm behind vent 22 on both sides. To accurately fix the kit, we should drill away an area of 11mm in length at the front end of the port area. And on the starboard side, we should fill in the front 15mm of the central area.

There were, quite naturally some exceptions. This is the Type VIIC we are studying, after all! On some boats the starboard central area did start at the usual location just behind vent 25. But for a distance of around three vent widths the front of the area is very narrow in height. The area here is more of a slit than a wide gap.

Another interesting aspect of the photo above regards vents 20 to 25. The top row from vents 1 to 19 are all in a neat straight line. But the five vents



Above (B14): This photo of U 331 shows that the main drainage slot on the starboard side started directly behind vent 25 (at the magenta arrow), but was very narrow in height for a distance. Farther back (at the green arrow) it widens out to be the normal height.



Left (B15): The photo of U 441 shows that this boat also had a narrow slit at the front of the starboard drainage area. The photo also shows blanking plates behind three vents. This feature was not that common but can be found in some VIIC photos. The area this usually occurred was at the rear of the main set of vents on the starboard side.

from 20 to 25 curve up slightly, and are slightly higher than the rest. This was likely done to keep an appropriate distance between vents 20 to 25 and the top of the saddle tank below. The crooked top row did occur on some other boats, while many others

such as U 552 had a nice straight top row.

Part IV - Type VII U-Boat Batches

Type VII U-boats built and commissioned into Kriegsmarine

Type VIIA batches (10)	
Shipyard	U-numbers
A G Weser, Bremen (6)	27-32
Germaniawerft, Kiel (4)	33-36

Type VIIB batches (24)	
Shipyard	U-numbers
Germaniawerft, Kiel (15)	45-51, 52-53, 54-55, 99-102
Flender-Werft, Lübeck (5)	83-87
Vegesacker Werft, Vegesack (4)	73-76

Type VIIC batches (574)	
Shipyard	U-numbers
Danziger Werft, Danzig (32)	401-404, 405-408, 409-412, 413-416, 417-420, 421-424,

Type VIIC Free-Flooding Vent Patterns

	425-428, 429-430, 1161-1162 (NB. 429-430 & 1161-1162 were in the same batch)
<i>F Schichau, Danzig (62)</i>	431-434, 435-438, 439-442, 443-444, 445-448, 449-450 & 731-734, 735-740, 741-746, 747-750, 825- 826, 1191-1198, 1199-1204, 1205-1210 (NB. 449-450 & 731-734 were in the same batch)
<i>Nordsee-Werke, Emden (26)</i>	331-334, 335-336, 337-338, 339-340, 341-344, 345-348, 349-350, 1101-1102, 1103-1106 (NB. 349-350 & 1101-1102 were in the same batch)
<i>Flensburger SchiffbauGesellschaft, Flensburg (20)</i>	351-354, 355-358, 359-360, 361-362, 363-366, 367-370
<i>Blohm & Voss, Hamburg (144)</i>	551-558, 559-562, 563-574, 575-586, 587-598, 599-610, 611-634, 635-646, 647-650, 951-958, 959-982, 983-994 (NB. 647-650 & 951-958 were in the same batch)
<i>H C Stülcken Sohn, Hamburg (24)</i>	701-706, 707-708, 709-710, 711-714, 715-718, 719-722, 905 & 907
<i>Howaltswerke, Hamburg (33)</i>	651-662, 663-668, 669-674, 675-680, 681-683 (684-686 not finished)
<i>Deutsche Werke, Kiel (30)</i>	451-454, 455-458, 465-468, 469-474, 475-480, 481-486
<i>Germaniawerft, Kiel (58)</i>	69-70, 71-72, 93-98, 201-204, 205-212, 221-226, 227-232, 235-240, 241-246, 247-250, 1051-1058 (NB. 69-70 & 93-98 were in the same batch)
<i>Howaltswerken, Kiel (32)</i>	371-374, 375-382, 383-386, 387-390, 391-394, 395-398, 399-400, 1131-1132 (NB. 399-400 & 1131-1132 were in the same batch)
<i>Flender-Werft, Lübeck (23)</i>	88-92, 301-302, 303-304, 305-308, 309-312, 313-316, 903-904
<i>Neptun-Werft, Rostock (8)</i>	921-924, 925-928
<i>Stettiner Orderwerke, Stettin (2)</i>	821-822
<i>Stettiner Vulcan Werke, Stettin (1)</i>	901 (902 suffered bomb damage and cancelled – not commissioned)
<i>Veegesacker Werft (Bremen Vulcan), Vegesack (52)</i>	77-82, 132-136, 251-255, 256-261, 262-267, 268-273, 274-279, 280-291
<i>Kaiserliche Marinewerft, Wilhelmshaven (27)</i>	751-762, 763-768, 771-776, 777-779

Type VIIC/41 batches (88)	
Shipyard	U-numbers
<i>Danziger Werft, Danzig (10)</i>	1163-1166, 1167-1170, 1171-1172
<i>F Schichau, Danzig (2)</i>	827-828
<i>Nordsee-Werke, Emden (4)</i>	1107-1110
<i>Flensburger Schiffbau Gesellschaft, Flensburg (8)</i>	1301-1304, 1305-1308
<i>Blohm & Voss, Hamburg (29)</i>	995-1006, 1007-1010 & 1013-1018, 1019-1025
<i>Germaniawerft, Kiel (3)</i>	1063-1065
<i>Flender-Werft, Lübeck (12)</i>	317-322, 323-328
<i>Neptun-Werft, Rostock (2)</i>	929-930
<i>Veegesacker Werft (Bremen Vulcan), Vegesack (18)</i>	292-297, 298-300, 1271-1273, 1274-1279 (NB. 298-300 & 1271-1273 were in the same batch)

Type VIIC Free-Flooding Vent Patterns

Type VIID batches (6)	
Shipyard	U-numbers
<i>Germaniawerft, Kiel (6)</i>	213-218

Type VIIF batches (4)	
Shipyard	U-numbers
<i>Germaniawerft, Kiel (4)</i>	1059-1062

Additional boats not finished

The above lists show all of the VIIs that were commissioned into the Kriegsmarine. However, there were a number of boats which were partially built before they were cancelled. There confusion over these boats can cause discrepancies in the total numbers of VIIs built. The lists below show the partially built VIICs and VIIC/41s that weren't commissioned into the navy –

Boats that had keels laid down and were launched –

VIICs 902, 906 (2 boats)
 VIIC/41s 1026-1030, 1173-1176 (9 boats)

Boats that had keels laid down but were not launched –

VIICs 684-686, 780-781, 823-824 (7 boats)
 VIIC/41s 329-330, 687-689, 723-724, 931-932, 1011-1012, 1031-1032, 1133-1136,
 1177-1179, 1280-1282 (17 boats)

Other boats were ordered but cancelled before the keels were laid down.

Type VII U-Boat Modifications

Contents

- ⊕ Part I Introduction
- ⊕ Part II Type VIIA & VIIB Modifications
- ⊕ Part III Early Type VIIC Modifications
- ⊕ Part IV Mid-to-late War Type VIIC Modifications
- ⊕ Part V Final Thoughts

Part I - Introduction

Several years ago, Revell released a 1/72nd scale kit of the early Type VIIC U-boat. The kit (number RV5015, named *Wolf Pack*) has become familiar to a large number of submarine modelling enthusiasts throughout the world. The aesthetic appeal of the VIIC and size of the kit enticed many armour and aircraft modellers away from their usual subjects and into the world of marine modelling. Due to the large scale and a market full of suitable aftermarket sets, it has also become a popular subject for many skilled super-detailers.

A little later, in 2006, Revell delighted us once again by releasing another 1/72nd U-boat kit (RV5045), this time for the Type VIIC/41. More recently Revell released a 1/144th scale early VIIC kit, which is essentially a half-sized version of its bigger brother. With such decent kits available to us, we now have the opportunity to make very accurate reproductions of the VIIC and VIIC/41 boats.

However, despite having decent kits to work with as a base, the opportunity for building very accurate VIIC models is still denied to many modellers. This is partly due to a limited understanding of the wide array of modifications that were made to the Type VIIC U-boat fleet. Without this essential knowledge, skilled super-detailers can opt for certain features that were not present on their chosen boat. Only with enough knowledge can their talents be fully utilised.

Whenever we study U-boats, we must always bear in mind that they were constantly modified. These improvements were made in an attempt to meet the changing technological and operational requirements of the Battle of the Atlantic. Newer more sophisticated equipment was fitted throughout the war. Older equipment was phased out, as were other features that were deemed to be superfluous to current requirements.

As a result of these modifications, the VIICs and VIIC/41s that managed to survive until the cessation of hostilities in 1945 had so many different external features to the first VIIC launched in June 1940. These modifications also mean that an individual boat could look different at various stages. For example, the tower of U 333 in April 1944 was very different to the tower of this boat when it was launched in June 1941.

Modellers often ask whether the U-boat they have chosen to model had net cutters, breakwaters or a wind deflector. And if so, when did their boat have these features? And when were they removed?

They are often unclear about what time period the Revell kits are suitable for, and what alterations are needed to depict a mid-war boat.

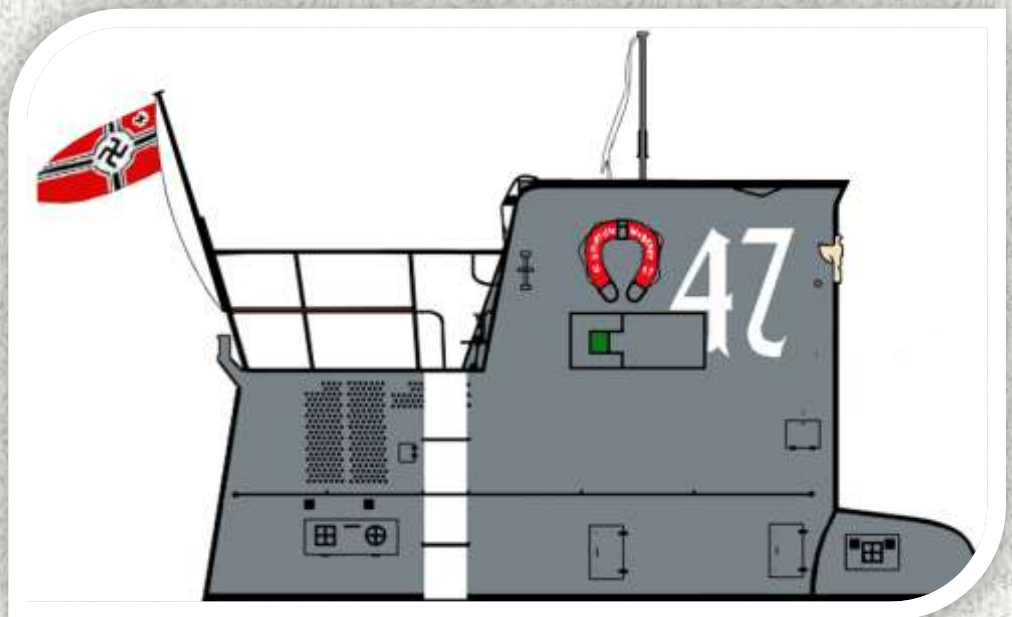
No book will answer these pertinent questions. Even with a dozen books at their disposal, each replete with period photos, the modeller will struggle to identify how their chosen boat was modified and what features were present at a given time. With this in mind, I have written this article to address some of modifications that VIIC and VIIC/41 modellers should be aware of. The modifications made to the Type VIIA and VIIB are included to show the developments of the VII that preceded the launching of the first VIIC. I have limited the scope of this article to points of specific interest to the U-boat modeller. As such this overview is **NOT** intended in any way to be a comprehensive paper detailing every change made throughout the fleet.

Part II - Type VIIA & VIIB Modifications

Pre-war features

The VIIAs and early VIIBs had the following pre-war features –

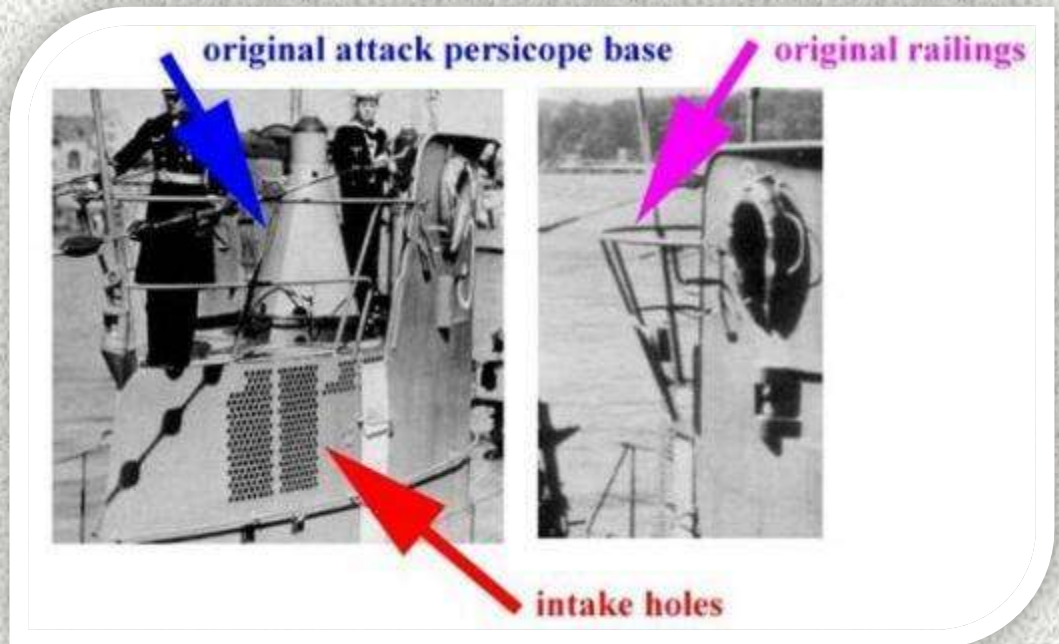
- The U-number painted in large white numerals approximately 1 metre tall on both sides of the conning tower.
- a small oval plate (on each side) inscribed with U and the U-number (eg. U 35) just under the small drainage holes near to the bow.
- a bronze eagle plaque on the front face of the tower.
- the red horseshoe-shaped lifebelts on each side of the conning tower had the flotilla and U-number (eg. “U-Flottille Wegener” and “U 48”) marked in white letters. In some cases the lifebelt may have been marked with only the U-number.
- two red and white emergency rescue buoys. One was located just forward of the 20mm gun mount and the other was on the forward deck, just aft of the capstan. 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-number.



Above: The starboard side of the U 47 at the start of the U-boat's career on the 17th December 1939. The pre-war features on the tower are the identification number, red lifebelt and bronze eagle at the front of the tower. The vertical board behind the rungs was in place only on this date, the day of the commissioning ceremony, so that the pristine paintwork would not be smudged by the tips of sailors' dirty boots. There is no spray deflector halfway up the front of the tower.

Attack periscope base

- The early attack periscope base was wider and of a simpler shape than the later bases. The VIAs and the early VIIBs U 45, U 46, U 47, U 48, U 49, U 51, U 52 and U 53 had the early base. The VIIBs U 83 - U87, U 99 – U 102, and all VIICs, had the later base. The VIIBs U 50, U 54 and U 55 may have had either the early or later base.



Above (C1a & C1b): Early features on two photos of the VIIB U 51. The shape of the early VII railings and the early attack periscope base can be seen. Note the vertical ridge along the rear of the base. There were two circular holes near the foot of the base, plus two semi-circular holes at deck level. The railing bars near the foot of the attack periscope base were to allow another lifebelt to be housed.

Left (C2): A comparison can be made between the tower railings and ventilation holes on either side of U 47's tower in this photo, taken at Wilhelmshaven on the 17th October 1939. The railing seat is longer on the starboard side. The railings do not overhang as much as the VIIC railings. At this stage the 20mm was located on the aft deck rather than the tower. In the foreground can be seen the 20mm mount, minus the 20mm itself, which was stored below.



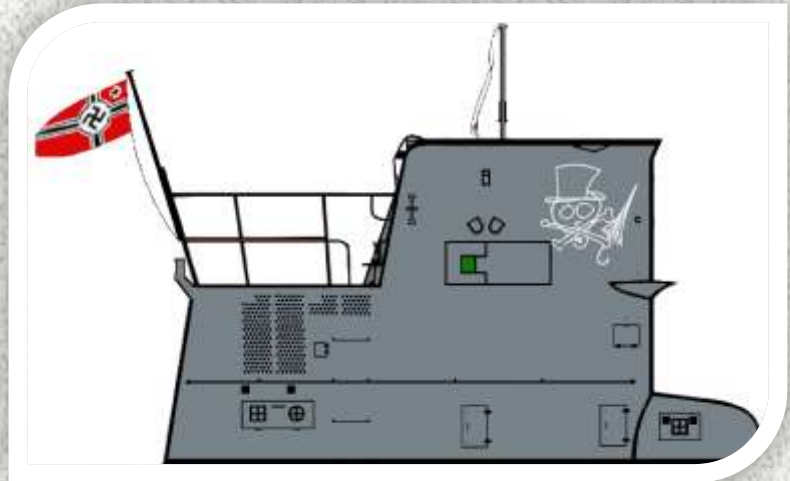
Net cutter – All the earliest VIIBs were launched with the net cutter. At some pre-war stages, some VIAs did not have the net cutter. For example, U 35 did have the net cutter at some stages before the war, while it is missing in other pre-war shots.

Breakwaters - One feature missing from the very earliest VIIBs was the breakwaters. These were fitted in 1939 to help protect the crew operating the 88mm deck gun from waves. The breakwaters were a standard feature of the VIIBs and VIICs when the earliest VIICs were launched. Note that the breakwaters did not feature on any VIAs.

Spray deflector - The earliest VIIAs and VIIBs did not have the spray deflector on the tower. A small deflector (which only partially extended around the tower) was fitted to the VIIBs in 1939 prior to the war.

Above right: U 47's tower in October 1939, with the small interim spray deflector.

Right (C3): The VIIA U 28, with Spanish Civil War stripes. The line of flooding holes along the hull casing show this to be a VIIA. There is no spray deflector halfway up the front of the tower. Some early VIIAs had a lattice mesh grill beneath the forward deck railings; this feature was discontinued at some stage.



Removal of pre-war features

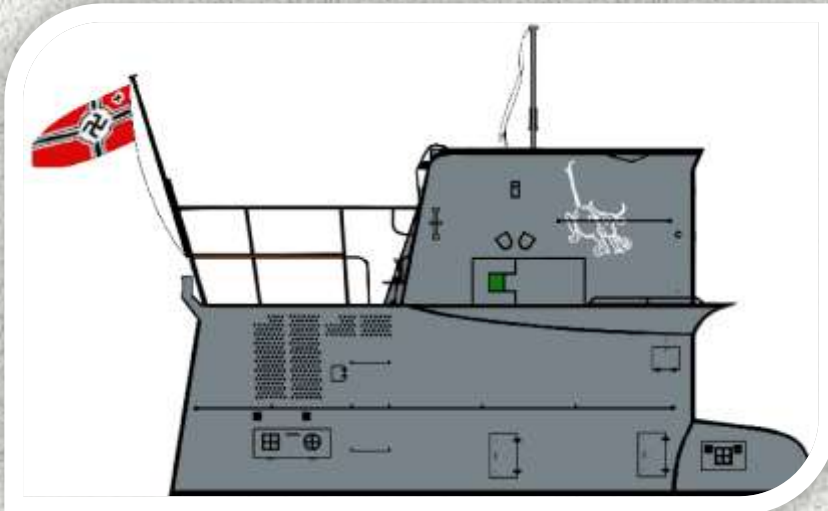
- In late August 1939, many U-boats left to take up positions at sea in readiness for the commencement of hostilities. Knowing that the war was to start, the Germans made the following changes before the boats left on patrol –

- large U-numbers painted over.
- oval bow plates removed.
- bronze eagle plaque removed.
- identification markings on the lifebelts and lifebuoys painted over.
- two red and white emergency rescue buoys moved inside deck hatches.

Early war VIIA and VIIB modifications

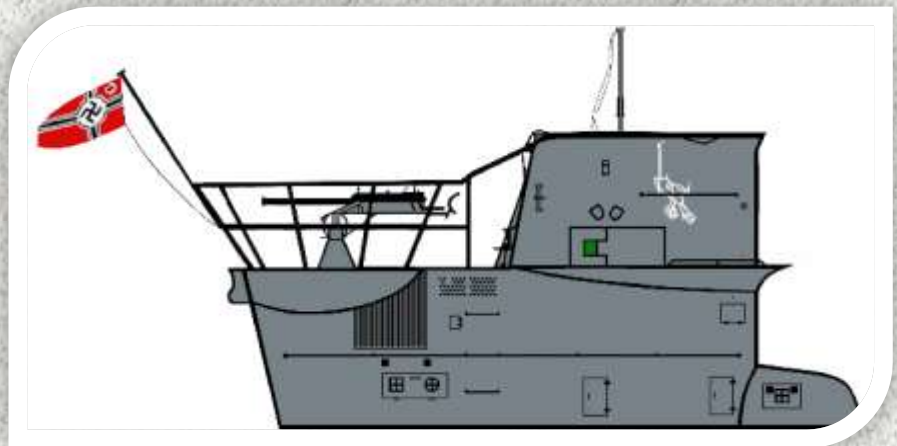
Spray deflector extension - In late 1939, the small interim spray deflector on VIIBs was extended around the tower.

Re-siting of 20mm - The VIIAs and the early VIIBs had their 20mm Flak gun mounted on the aft deck. This was not an ideal site as the tower created a dead zone, it took time to get the gun into action, and it took time for the crew to get inside the U-boat in an emergency. For these reasons, it was decided to move the Flak gun to the aft end of the conning tower. The re-siting of the 20mm took place over the cold winter of 1939/40.

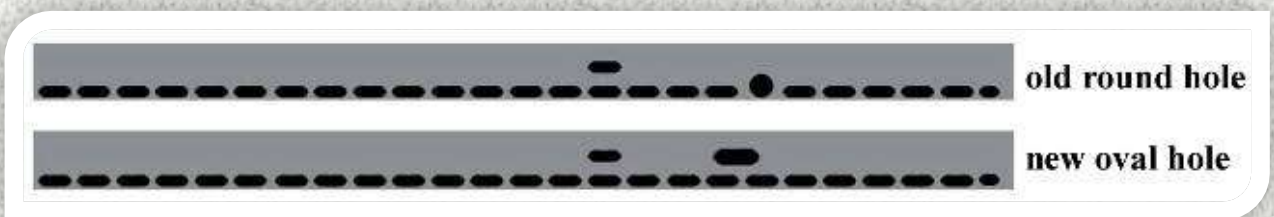


Left: A larger spray deflector was extended to the rear of the tower bulwark.
Below: A few months later the rear of the VIIA and VIIB towers were completely rebuilt to accommodate the 20mm.

To accommodate the 20mm, the rear of the conning towers had to be greatly modified. The railings curved around in a circular shape to follow the much wider circular-shaped tower floor. These significant changes made the tower look quite different than before.



Since the rear of the tower was much larger than before, the rearmost vertical railing stanchion was located farther aft than it had been earlier. It was so much farther aft that the trailing edge of the new VIIB towers sloped in the opposite direction than



before. A comparison between the old and new towers can be seen later in this article.

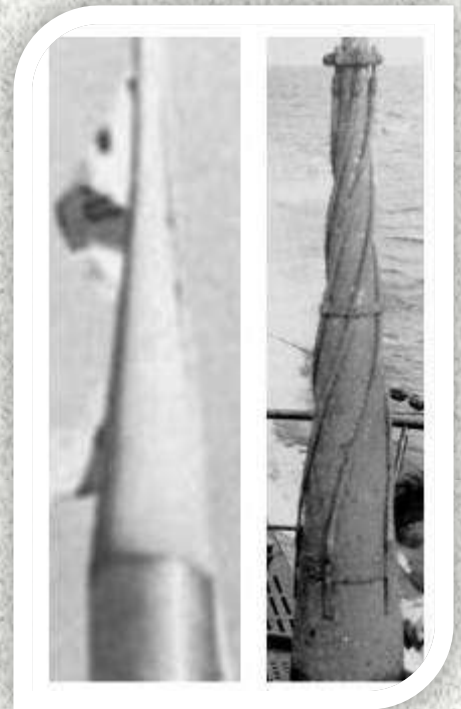
Above: The change from round to large oval exhaust outlet.

The anti-slip bars around the old 20mm mount location on the aft deck were removed at this time.

Exhaust outlet - At some stage, perhaps the spring of 1940, both diesel exhaust outlets were modified from being round in shape to being oval in shape. The changes in exhaust outlet are covered in more detail later in this article.

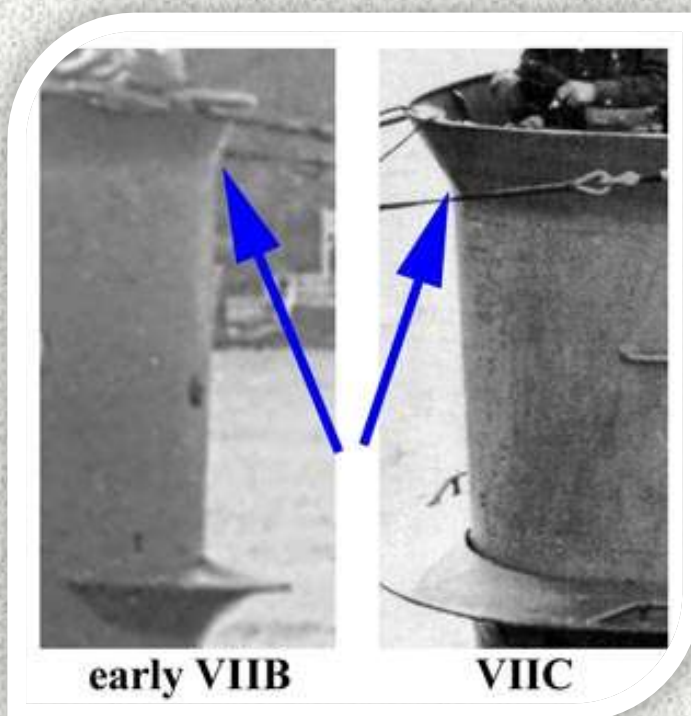
Anti-vibration wires - The top of the attack periscope on VIIAs and early VIIBs had no wires around the top. At some stage in 1940, anti-vibration wires were added to the top of periscopes to help reduce the wake left by a raised periscope. All the VIICs would have this feature.

Tower top edge – On the VIIAs and early VIIBs, the top of the tower on the outside face curved outwards at the top. At some stage it was decided to increase this curve slightly. On the images below, the vertical sides on the early VIIB extend higher up than on the VIIC (the blue arrow shows where the tower began to curve). This difference was quite slight, and isn't that noticeable unless one studies photos closely.



Above (C4a & C4b): On the left can be seen an early attack periscope, with no wires. The photo on the right shows anti-vibration wires winding around an attack periscope.

Left (C5a & C5b): A comparison between the top edge on an early VIIB and a VIIC.



The VIIAs and the early VIIBs U 45, U 46, U 47, U 48, U 49, U 51, U 52 and U 53 had the early tower top. The VIIBs U 50, U 54, U 55, U 83 – U 87, U 99 – U 102, and all VIICs, had the later top.

Air supply

On VIIAs and VIIBs, the main trunk providing air to the diesels was routed forward under the rear deckcasing, and then up inside the rear end of the tower (under the deck platform). Ventilation holes to let air into the intake trunk were located on the sides of the tower walls, primarily on the starboard side. As these were susceptible to interruption in high seas, this flawed design offered an inadequate supply of air to the diesels. Several modifications were made to the VIIAs and VIIBs to improve the air supply. NB. As all VIICs had trunks built up the inside of the tower bulwark (at the rear of the bulwark), none of the VIICs suffered from this problem.

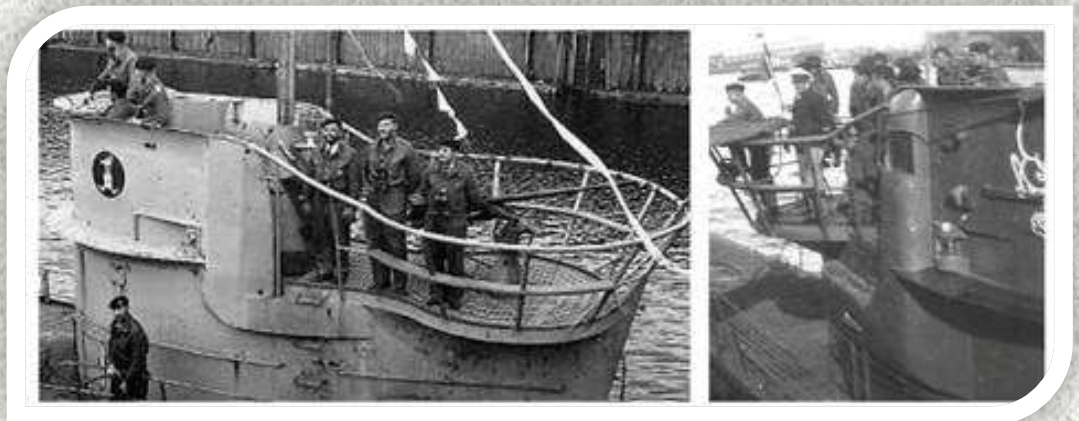
Air supply 1 (grill) – The addition of the 20mm to the tower resulted in some of the ventilation holes on the starboard side being blocked over. To compensate for the loss of these ventilation holes, a grill with vertical bars was added to the starboard side. All the earliest VIIBs - including U 47, U 48 and U 99 - had this grill on the starboard side of the tower.

A few of the ventilation holes on the port side were also blocked over by the addition of the 20mm. However, as these were fewer in number, the fitting of a similar grill to the port side was not deemed necessary.

Right: The grill with vertical bars can be seen below the 20mm. A similar grill was **not** added on the port side.



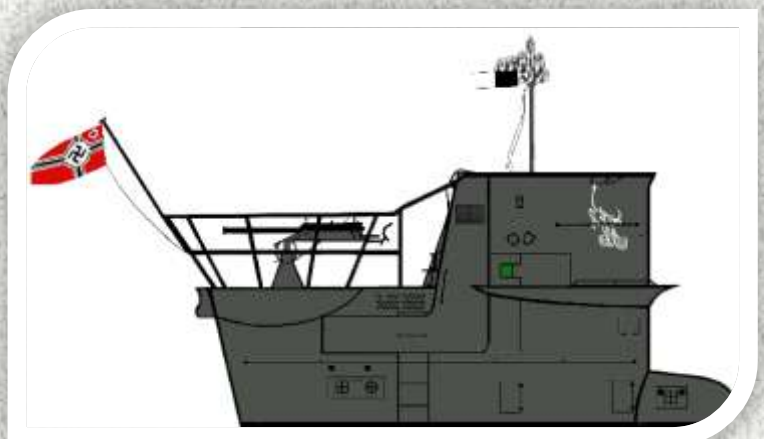
Air supply 2 (trunking) – The supply of air to the diesels remained poor. In an attempt to resolve the issue, large air trunks were introduced in the summer of 1940. Two large L-shaped external trunks were built up both sides of the tower; these started under the 20mm platform and extended up the outside of the tower bulwark. The order to fit these trunks was placed on the 29th July 1940.



Above (C6a & C6b): The L-shaped air trunks on the VIIA U 30 (left) and the VIIB U 47 (right). The trunks on U 30 were squarer in shape and smaller than the more rounded trunks on the VIIB. Note also the grill was on the side of the U 47 trunk, as opposed to the top of the trunks on U 30.

Below right: The tower of U 47 in late 1940, with air trunking on both sides. Note the grip, rung and ladder, which helped crewmen climb up from the deck to the tower.

There were some differences in design between the air trunks. Some were squarer in shape than others. Some boats such as U 30 and U 101 had the grill on the top of the trunks (horizontal surface) while other boats such as U 48 and U 52 had the grill on the sides of the trunks (near the top, on the vertical surface). There were often slight differences between the grill designs. For example, the grill on U 47 and U 48 was a mesh while U 73 had a series of vertical bars.



Grip bars and rungs were added on top of air trunks to allow the crewmen to climb up the sides of the tower. On some boats a short ladder was added from the bottom of the trunk to the deck below. On others such as U 52 no ladder was added.

Air supply 3 (teardrop fairing) – The L-shaped trunks were not the ultimate answer to the air supply problem. Their bulk and position meant that crewmen had to clamber over them when climbing from the deck to the tower. In the spring of 1941 existing VIIBs (and possibly some VIAs) had their L-shaped trunks removed. A teardrop shaped fairing was then mounted onto the rear of the attack periscope base. U 48 operated with this new intake on the boat's last operational patrol. All the other VIIBs which survived until this time period were fitted with this new feature.

VIAs and VIIB deck railings

On the early VIAs and VIIBs, the forward deck railings had only one horizontal bar. There were no wires between the forward deck railings and aft deck railings - they were entirely separate from each other. Following an order placed on the 12th July 1940, two wires were added per side from the forward deck railings to the aft deck railings. These were added in order to help prevent crewmembers from falling overboard. However, the low height of the forward railings meant that an additional three bars - arranged in a triangular shape - needed to be added to the rear of the forward deck railings. These three bars raised the height of the attachment points, thus allowing two wires to run from the new bars back to the aft deck railings.

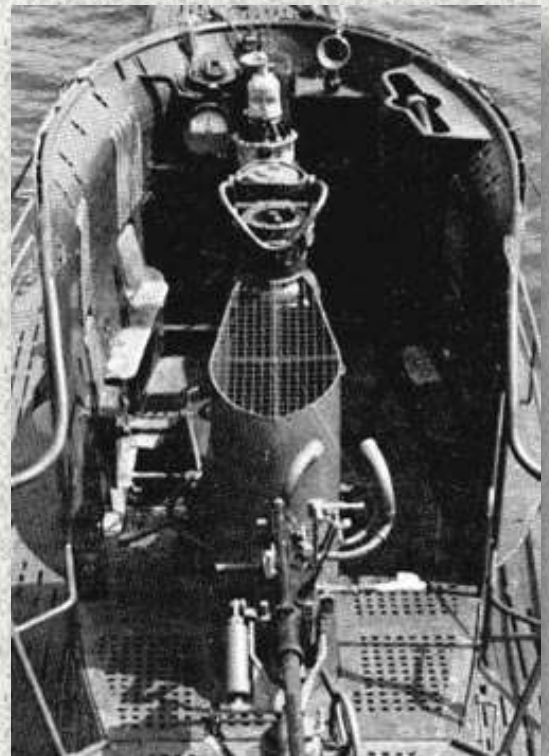
Extra railings were also introduced between forward and aft railings on VIAs. Rather than having wires, the VIAs had a full set of railing (with three horizontal bars) added to this area.

The early VIAs and VIIBs had a wooden seat on either side of the aft deck. Some boats (U 47 and U 52) had the wooden seats on the aft deck railings removed, leaving only the supports remaining. On other boats (U 46 and U 48) the seats remained in place.

On the front set of railings, one of the horizontal bars (shown in green in the drawing below) was slightly thinner in diameter than the rest. This bar (or both bars when there were two) could be removed. This did happen occasionally in port, when a plank of wood or walkway was extended over the deck at this location; this set up allowed men to walk freely onto to the deck without stepping over the forward deck railings.

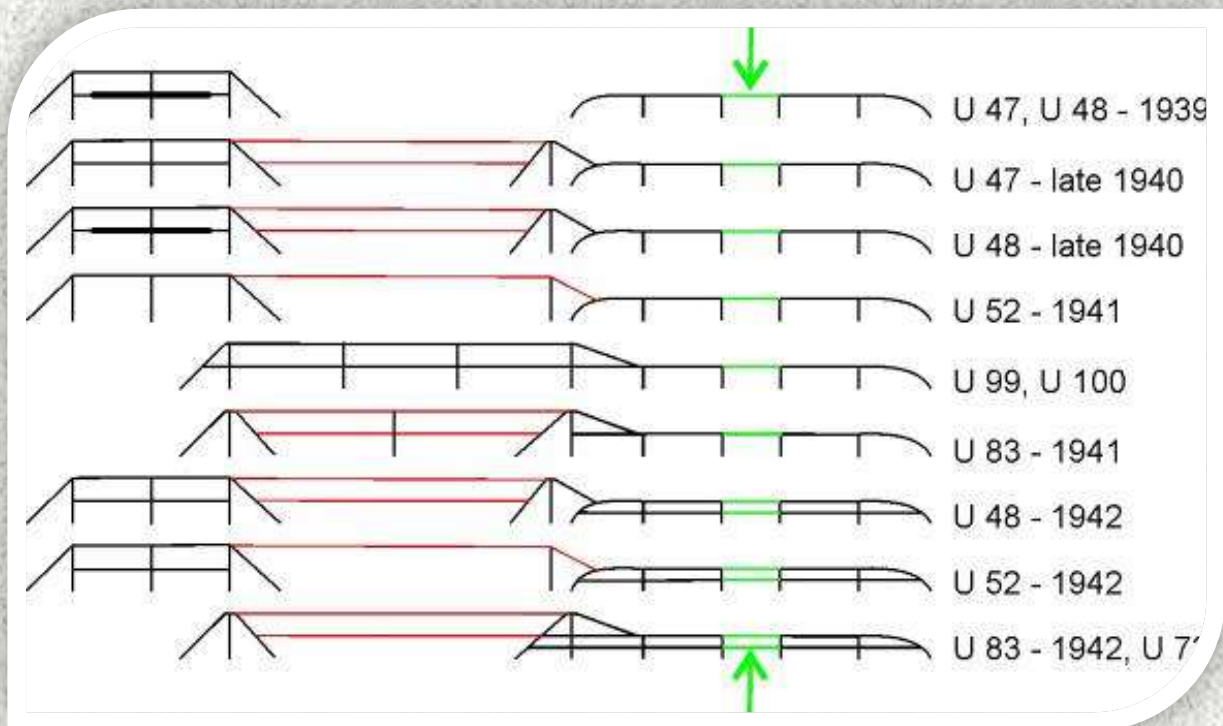
When in port, removable deck railings could put in place. These removable railings were housed in the circular holes along the edge of the deck. This tended to occur in pre-war times more than in wartime. However, during wartime commissioning ceremonies the removable railings were usually in place. When the removable railings were used, two stanchions were placed at either end of the green section in the drawing above. There were attachment points (both at the top and bottom) on these horizontal stanchions, and these attachments allowed the removable railings to stay in place.

If we look again at the drawing below we can see that U 99 had a completely different set of railings. This style was a precursor for the late VIIB and VIIC railings which were to follow. In the U 99 style, there were no wires between front and aft railings. Instead there was a full set of railing bars.



Above (C7): The teardrop shaped fairing behind the attack periscope base on the VIIB U 86. The grill is at the top of the fairing.

Since U 99 never had a 20mm mount on the aft deck, there was no requirement to have a set of deck railings so far back on the aft deck. As a result, the aft railings on U 99 (and late VIIBs and all VIICs) only extended past the tower by a short distance.



Above: A rough sketch of the starboard railings evidenced on VIIB decks. The red lines are the wires which extended from the front to aft railings. The green lines are the removable bars.

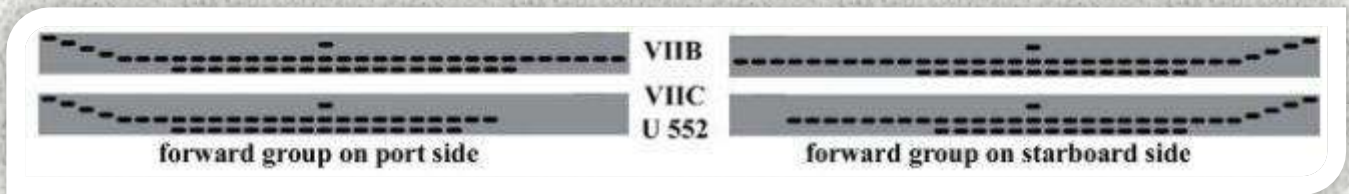
On late VIIBs such as U 83 yet another style of railing was added. These were similar to the U 99 railings, except with wires rather than bars between the front and aft set of railings. It was this style of railing that became standard on all the early VIICs.

On the 3rd February 1941 an order to modify the deck railings was issued. An extra horizontal bar – at mid-height – was to be introduced to the forward railings on VIIAs, VIIBs and VIICs. This order did take some time to complete. U 48 did receive the extra horizontal bar but only after the boat was relegated to training duties in June 1941.

Differentiating between variants

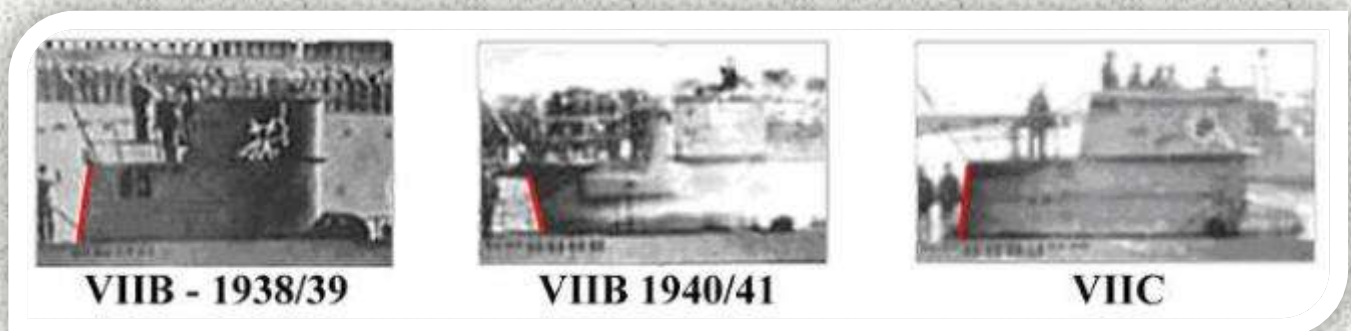
When we are collecting research material for our VIIC or VIIC/41 models, it can be very helpful to be able to differentiate between a VIIC and other VII variants. The VIIAs had a double line of free-flooding holes along the forward end of the hull casing. The top line of holes extended in an unbroken line all the way back over much of the saddle tanks. This pattern of holes, and part of the aft torpedo tube visible on the aft deck, are obvious ways of telling a VIIA in an above-the-waterline photo.

Although the VIIBs look similar to the VIICs, there are several ways of distinguishing between the two variants. A clear method of identifying a VIIB is to count the number of free-flooding holes on the forward hull casing. All VIIBs had more free-flooding holes on the hull casing than on VIICs. The different hole patterns are covered in more detail in the accompanying article *Type VIIC Free-Flooding Vent Patterns*.



Above: On the starboard side of all VIIBs, the top line of the forward group of main holes all have 28 holes. The maximum number on VIICs was 25. On the port side the VIIBs also had 28 holes. The maximum number on VIICs on the port side was 21.

Below (C8a-C8c): The red line has been added over the trailing edges. The left image shows the trailing edge when the 20mm mount was on the aft deck. A comparison of the middle and right image shows how we may distinguish a VIIB with the 20mm on the tower from a VIIC.



If there is no 20mm on the tower we can be certain the boat is an early VIIA or an early VIIB. To distinguish between a VIIC and a VIIB that has the 20mm on the tower, we only need to look at the trailing edge of the tower. The VIIBs with the 20mm had the trailing edge sloping in the opposite direction.

If we see L-shaped trunks or the teardrop fairing we know the boat is either a VIIA or VIIB. The reason we can be sure of this is that on all Type VIIC U-boats the air intake trunks were built up the inside walls of the tower.

The VIID can be distinguished by the minshafts directly behind the tower. The VIIF can be easily recognized by the extended length and the numerous free-flooding holes extending all the way along the hull casing.

A number of the VIIC modifications which follow in the next section were just as applicable to the existing VIIBs as they were to the VIICs. These modifications were made to all the existing VIIBs and VIICs, regardless of the variant. For example, when U 48 was relegated to training duties the boat had the net cutter removed and was fitted with a wind deflector flange.

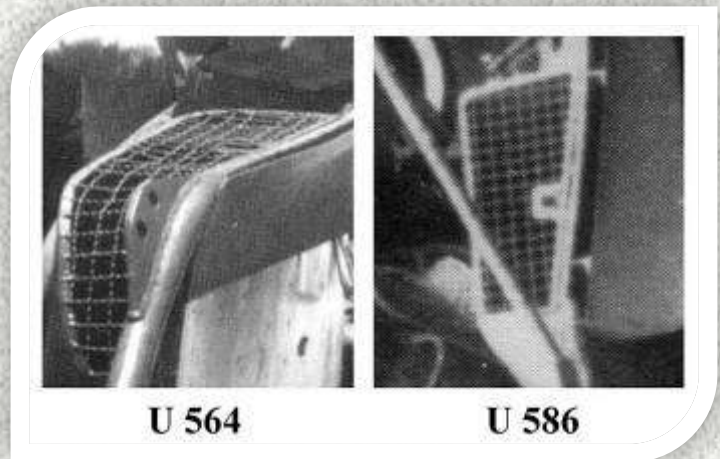
Part III – Early Type VIIC Modifications

Air intake grills

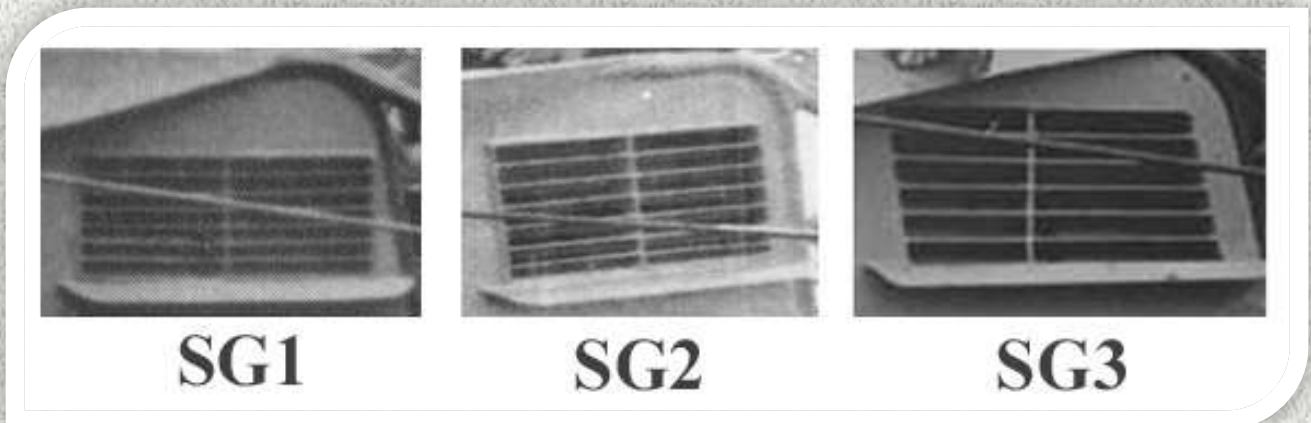
On all Type VIIC U-boats the air intake trunks were built up the inside walls of the tower. There were two styles of intake grill on VIICs -

Mesh grill - This most common style, found directly at the top of the trunks, took the form of a wire-mesh screen. It can be seen at the top of Revell parts 49 and 50 (the part numbers in the text below refer to part numbers in Revell's early VIIC kit).

Slat grill - This less common style was found on the outside walls of the tower, high up and near the rear, and took the form of slats (parts 117 and 118). There were three different styles of slat grill. SG1 and SG2 featured on *Germaniawerft* built boats in the batches U 69 - U 72, and U 93 - U 98. SG3 appears to have featured on the *Blohm & Voss* built boats in the U 551 - U 557 batch.



Above (C9a & C9b): Two different types of mesh grill.
Below (C10a-C10c): Three different types of slat grill



SG1 - 7 horizontal spaces, with a vertical bar in the middle. The border sides were directly vertical, and not sloped. This group included U 95, U 96 and U 97.

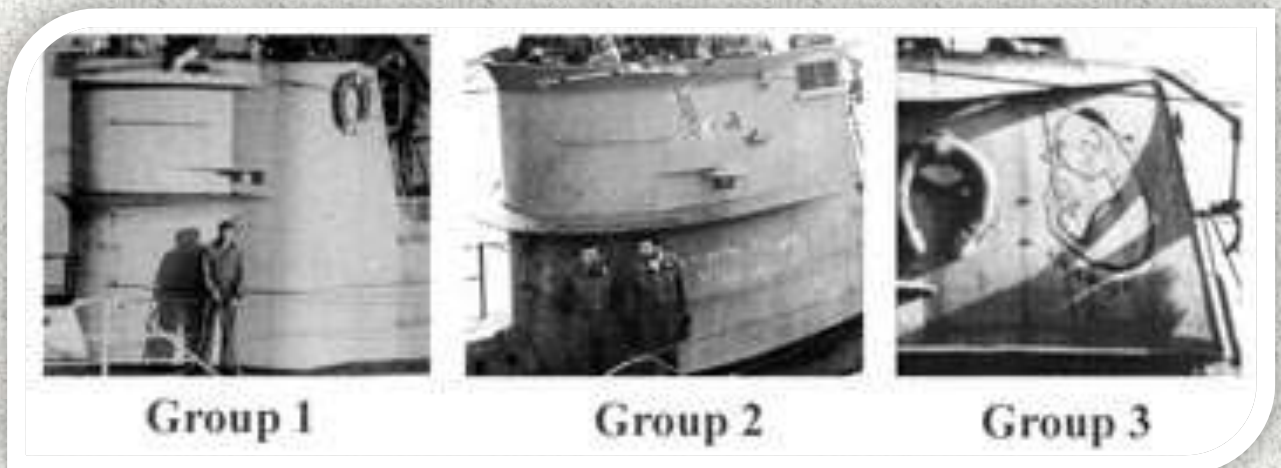
SG2 - 7 horizontal spaces, with a vertical bar in the middle. The border sides were sloped, as was the vertical bar. This group included U 69, U 71, U 93 and U 94.

SG3 - 6 horizontal spaces, with a vertical bar offset from the middle. The border sides were sloped, but the vertical bar was directly vertical. This group included U 552 and U 557.

There was usually a curved lip below the grill on the majority of boats. One exception was U 95, which had no lip in this area.

Mast antenna housing

The majority of VIICs had a hydraulically extendable mast antenna housing (hereafter referred to as MAH) on the port side of the tower. However, some of the early VIICs did not have the MAH (part 125 in Revell kit). Looking from above, the MAH is semi-circular in shape, and greatly changes the look of the tower on the port side.



The following is a guide to which boats had the MAH and air intake grill styles –

Group 1 – The majority of VIICs had the MAH. All boats with the MAH had the mesh grill. All boats other than those with the numbers below fall into this category.

Group 2 – The very earliest VIICs had the slat grill and no MAH. These were U 69 - U 72 (*Germaniawerft*), U 93 - U 98 (*Germaniawerft*), U 551 - U 557 (*Blohm & Voss*), and U 331 (*Nordsee-Werke*). The popular boats U 69, U 96 and U 552 therefore fall into this category.

Group 3 – Some other boats had the mesh grill but no MAH. Many, if not all, of the *Blohm & Voss* boats between and including U 558 and U 574 fall in this category. Other boats which fall into group 3 are U 392, U 651 and U 751, which were all built at different shipyards. Given the large number of VIICs built, it is likely that other boats also fall into group 3.

Above (C11a-C11c): The semi-circular MAH can be seen to the right of the crewmen in the Group 1 photo. A lifebelt is attached to the top of the MAH.

Right (C12a & C12b): The top of the MAH had different features. Boats such as U 201 and U 404 had the type featured in the left photo, which may be an earlier style. Many other boats, such as U 441 in the right photo, had a tube next to a protective bar. The height of the cylinder and protective bar varied between boats.



Earliest VIIC features

Net cutters - The one feature which has sparked countless questions is the net cutter (parts 111 to 114). Two net cutters were present at the bow of the very earliest VIICs - one on the forward deck and the other below the waterline on the stem. On the 1st March 1941 the order to remove the net cutters was issued. As a result, **most** of the net cutters were removed in March and April 1941.



Above (C13a & C13b): The photo on the left shows U 96 with a net cutter. The photo on the right shows U 96 after the net cutter had been removed. The red arrows point to two of the triangular attachment points which were left at the edge of the deck when the net cutters were removed. There would be five brackets in total left upon removal of the net cutter.

However, the net cutters were not removed from all boats in this period. For example, U 96 still had net cutters when arriving back from patrol on the 22nd May 1941. Similarly, U 94 still had net cutters when returning from patrol on the 4th June 1941. U 94 had been in port throughout March, and again for 11 days in April. But there are a variety of reasons why the net cutters were not removed from U 94 during these two periods. One reason may have been the necessity to get the boat back to sea as quickly as possible.

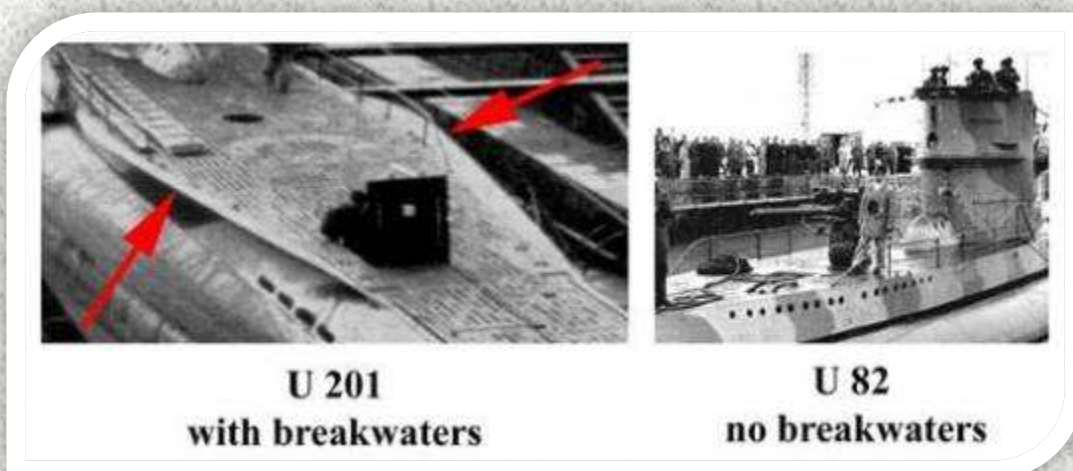
Opinions on whether the lower net cutter was removed at the same time as the upper net cutter vary. Some enthusiasts suggest the lower one may have been left in place. Others hold the view that both would have been removed at the same time. As I have yet to find a photo of a boat with a lower net cutter but no upper net cutter, I would suggest the latter.

The net cutter removal was not just applicable to VIICs. The Type IIs, IXs, VIIAs and VIIBs that were serving in the spring of 1941 all had their net cutters removed as well.

Breakwaters - The order to remove the breakwaters (parts 115 and 116) from VIIBs and VIICs was issued on the 21st May 1941. However, a few boats such as U 96 had their breakwaters removed slightly earlier. Generally speaking, the removal of the breakwaters occurred in the April/May/June 1941 period. Prior to this the breakwaters were generally present, while after this they were generally absent. The removal of this feature before the order issue date may have been done for evaluation purposes.

A

Right (C14a & C14b): Type VIICs before and after the fitting of the breakwaters.

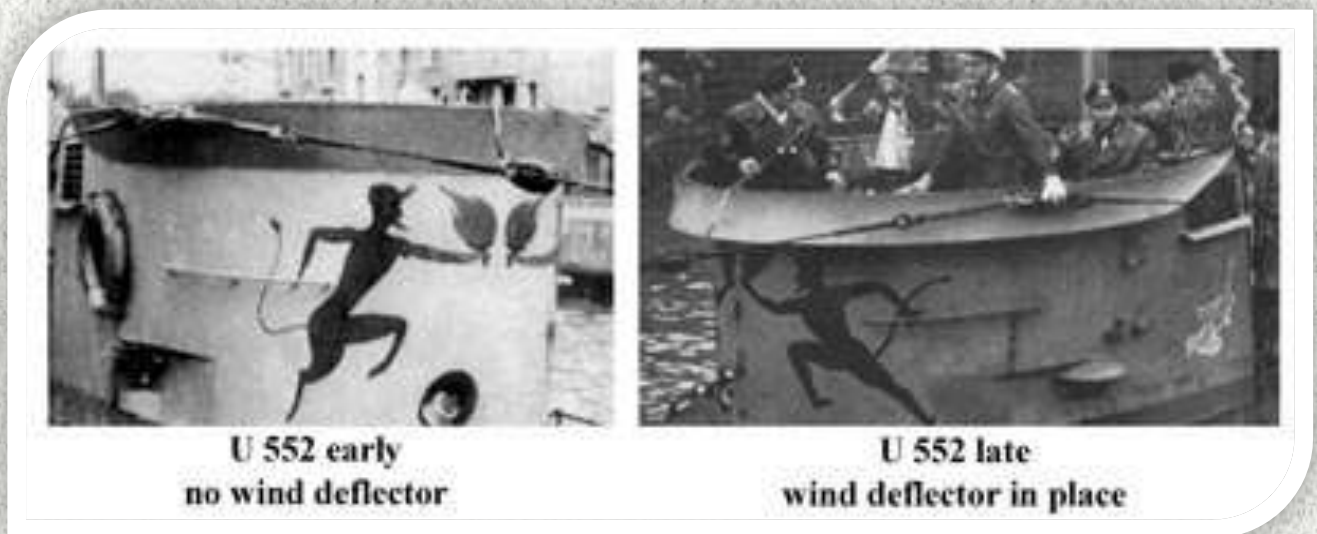


pattern of small, round free-flooding holes usually replaced the breakwaters. This was intended to help the boat dive slightly faster, but any improvement must have been marginal. Some boats, and indeed all of the late war VIICs and VIIC/41s, did not have any holes in this area at all.

The pattern of holes in this area are covered in the accompanying article *Type VIIC Free-Flooding Vent Patterns*.

Wind deflector - Another modification was the wind deflector (parts 121 or 124). Fitted around the outside edge of the top of the tower, this flange was intended to block some of the wind and spray that blew upon the lookouts' faces. Note that this wind deflector is not to be confused with the spray deflector that featured halfway up the tower on every VIIC.

The earliest VIICs did not have the wind deflector. The fitting of the wind deflector was ordered on the 29th May 1941. However, the process of fitting this feature seems to have been between



December 1940 and December 1941 or so – a far greater time period than the process of removing the net cutters or breakwaters. One of the first boats to be fitted with this feature was U 69; it was present during the boat's commissioning ceremony on the 2nd November 1940. Other early examples of boats with the wind deflector are U 651 (December 1940) and U 96 (April 1941). But most boats during this period did not have this feature. It began to appear very slowly throughout the course of 1941. By July 1941, U 203 and U 701 did not have this feature. U 201 did not have the wind deflector in July either, and may not even have had this in September 1941. Nor did U 559 have this feature by late October 1941, while U 564 appears not to have had a wind deflector in November 1941.

Above (C15a & C15b): The same boat – U 552 – before and after the fitting of the wind deflector.

Generally speaking, therefore, the wind deflector appeared as early as November 1940 but was still not present on some boats in November 1941. The boats that did have this feature before the order was issued were likely modified for evaluation purposes.

There may have been exceptions in relation to the boats serving in the Mediterranean. The VIIB U 73 did not even have wind deflector in September 1942, nor did U 81 in April 1942. This may have been in relation to the boats serving in the Mediterranean theatre.

Experimental wind deflector - The reason that U 69 was fitted with the wind deflector at such an early stage may have been for test purposes. In the months that followed there was likely an assessment of whether the flange had any appreciable benefit to the crewmen in the tower.



Left (C16): An experimental wind deflector on U 71.

A different style of wind deflector was tried out on U 71. This experimental deflector consisted of ten vertical supports; these may have been intended to break the waves flowing against the tower. U 71 did have these supports during the boat's commissioning ceremony (with 12 rather than 10 supports). Two of the supports were removed at some stage. The boat still had these supports by the time it put into St. Nazaire in July 1941, and may have retained them into 1942.

U 70 also had these ten vertical supports, which were added some time after the launching of the boat in October 1940. At the beginning of 1941, U 70 had the usual style of wind deflector flange **on top** of the supports. A very fine photo of this feature, and informative text, can be found on pages 18 and 19 of edition 3 of the magazine *U-Boot im Focus*. The magazine always includes particularly interesting and good quality U-boat photos, and is highly recommended.

Combinations on popular boats - The following is a partial list of the combinations on the most popular boats. This is not complete due to absence of photographic material.

Combination on popular U-boats				
Boat	Time	Netcutter	Breakwaters	Wind deflector
U 69	19/09/40 (launch)	Y	Y	N
	02/11/40 (com)	Y	Y	Y
	05/05/41-08/07/41 (P3)	?	Y	Y
	Later in 1941	N	N	Y
U 93	Until 14/02/41 (com,P1,P2,P3)	Y	Y	N
	03/05/41-10/06/41 (P4)	Y	N	N
	(Possible combination?)	N	N	N
	Later in 1941	N	N	Y
U 94	Until 04/06/41 (com,P1,P2,P3,P4)	Y	N	N
	By late 1941	N	N	Y
U 96	14/09/40 (com)	Y	Y	N
	12/04/41-22/05/41 (P4)	Y	N	Y
	27/10/41-06/12/41 (P7)	N	N	Y
U 201	07/12/40 (launch)	Y	Y	N
	22/04/41-18/05/41 (P1)	N *	Y	N
	08/06/41-25/08/41 (P2,P3)	N	N	N
	Later in 1941	N	N	Y
U 552	14/09/40-16/03/41 (launch, com, P1)	Y	Y	N
	07/04/41-06/05/41 (P2)	N	Y	N
	Later in 1941	N	N	Y

Y=yes, N=no, P = patrol number, com = commissioning ceremony

* The absence of the net cutter on the 1st patrol is likely but not certain.

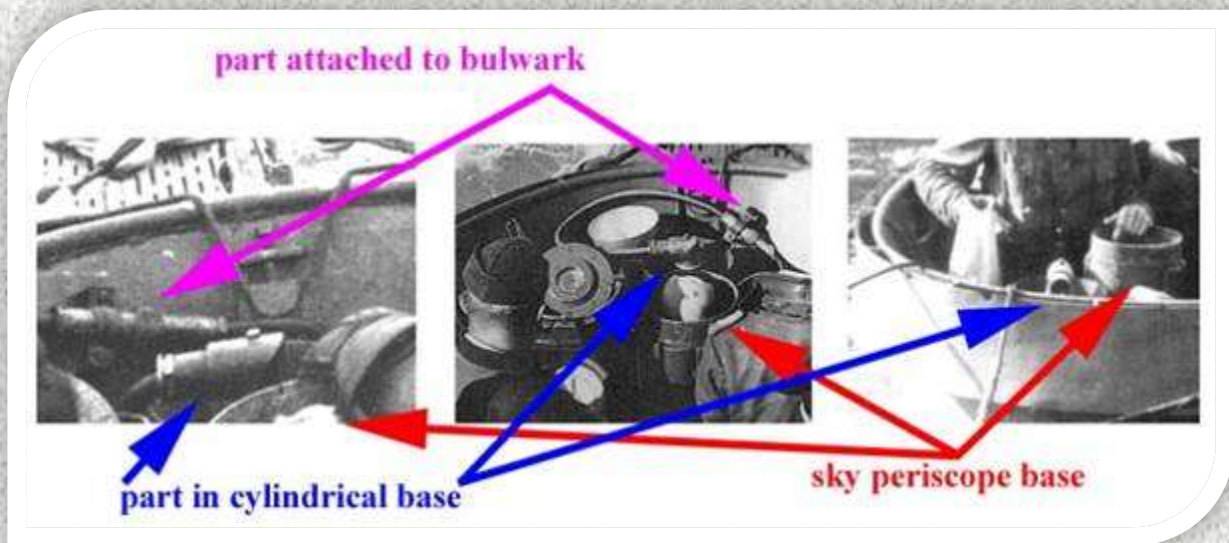
Please note the following on U 96 –

- the combination featured on U 96 in April and May 1941 (4th patrol) was quite unusual. The net cutter would usually be removed before the breakwaters were removed.
- Lothar-Günther Buchheim was a guest aboard U 96 on the 7th patrol. He drew upon his experiences when writing his classic novel *Das Boot*. The movie of the same name was based upon Buchheim's novel. .
- the U 96 in the movie *Das Boot* has the following combination: netcutter-yes, breakwaters-yes, wind deflector-yes.

Please note the following on U 552 –

- U 552 had a sortie from 13/02/41 to 15/02/41. The 1st active patrol was from 18/02/41 to 16/03/41. On some sources the 1st patrol is given as the 2nd sailing (and the sortie given as the 1st sailing). Just to be clear, here the 1st patrol (P1) refers to the period from 18/02/41 to 16/03/41.
- the addition of the wind defector to U 552 may have occurred during the same refit as the removal of the breakwaters or, as in the case of U 201, during a later refit.

Mobile voice pipe - On the very earliest VIICs (and VIIBs) there was a piece of equipment at the front of the inside of the tower. The part can be seen in the photos below -

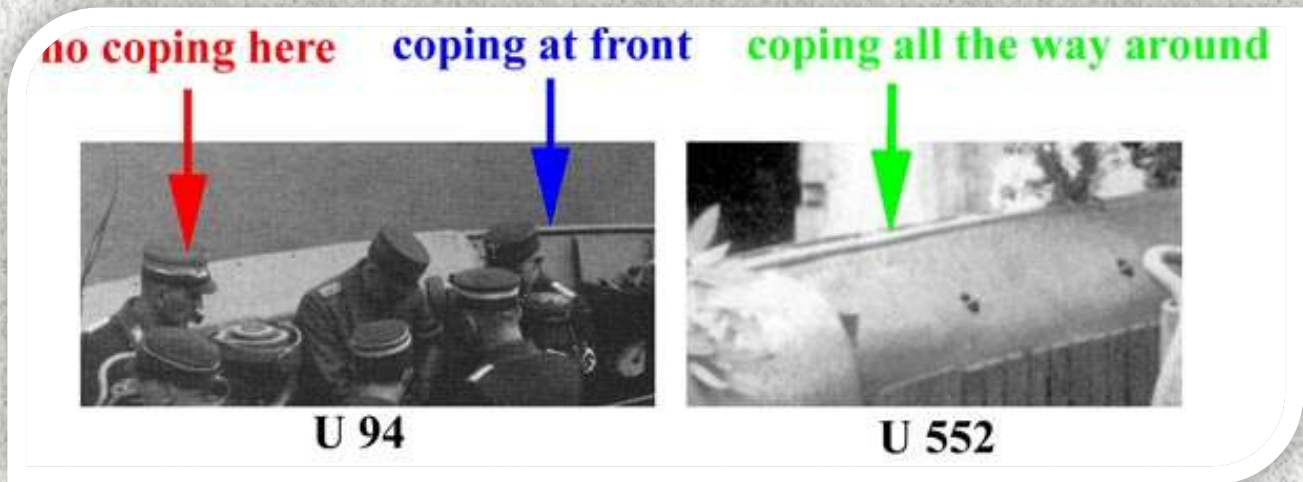


Above (C17a-C17c): The red arrows point to cylindrical base for the sky periscope, with the head of the sky periscope visible at the top. Ahead of the periscope base was another cylindrical object, which did not extend as high up as the periscope base. The blue arrows points to this base and the part inside. If we look at the middle photo we can see what appears to be a rubber hose running to another part. This second part, pointed to by the magenta arrows, was attached to the tower bulwark (sometimes this part offset to port, other times offset to starboard).

It has been suggested that this mystery equipment may have been a mobile voice pipe. The parts were in place on U 69, U 94 and U 96 but whether it featured upon U 201 is unclear. It was not in place on U 552 or the mid to late war VIICs.

Coping - On the earliest boats, coping (a circular bar) ran along the inside of the top edge of the bulwark. This only featured at the front of the tower, and was not in place towards the rear. This was the

Below (C18a & C18b): Slight differences in the coping can be found between U 94 and U 552.



case on early VIIBs (such as U 48 and U 99) and earliest VIICs (such as U 69 and U 96).

Other boats (such as the VIIB U 86 and the VIIC U 552) the coping was extended around the whole of the top of the bulwark, all the way to the rear of the tower.

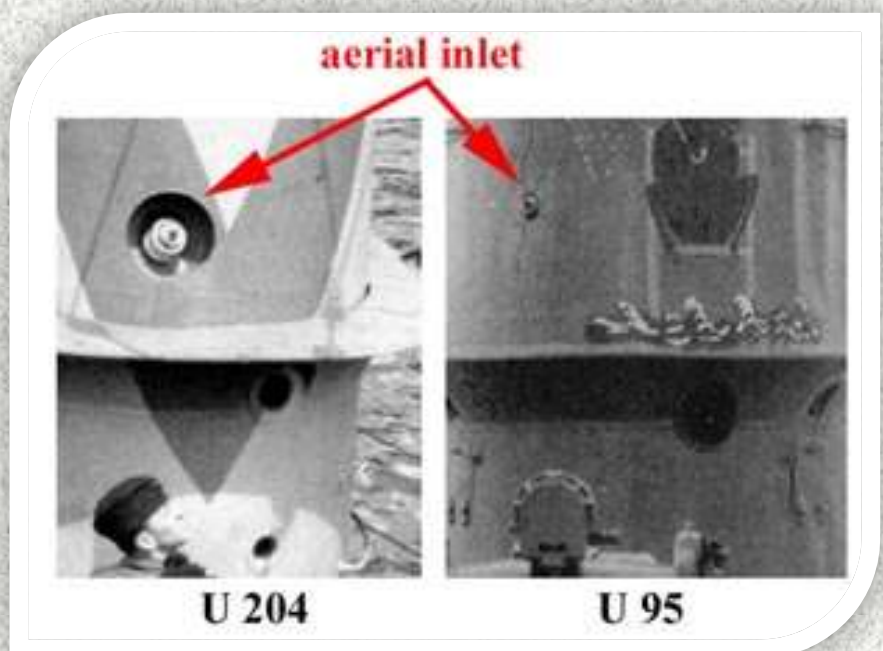
Tower railing seats - Many VIICs had three separate seats on either side. Examples include U 253, U 404, U 441, U 552, U 558, U 570 and U 586. However, some boats had one long seat, which extended the same length of the three small ones. This one long seat per side featured upon U 69, U 71, U 94, U 96 and U 201. This one long seat does appear to be particular to early *Germaniawerft* built VIICs.

U 93 – U 98

The earliest *Germaniawerft* boats in the U 93 - U 98 batch had three features that remained from the VIAs and early VIIBs.

U 93 – U 98 forward radio aerial inlet - The spray deflector on VIICs was located halfway up the outside face of the tower. Just above the spray deflector was a hole offset to starboard. Inside this hole was the radio aerial inlet for the forward jumping wire. A thin wire extended from this inlet to the jumping wires (which served as a radio aerial) above. This inlet was an insulated conduit which prevented the wire from short

Below (C19a & C19b): The different aerial inlets on U 95 and U 204. The two holes (one of which is for a foghorn) can just be seen below the spray deflector. On late war boats one or both of these holes was omitted.



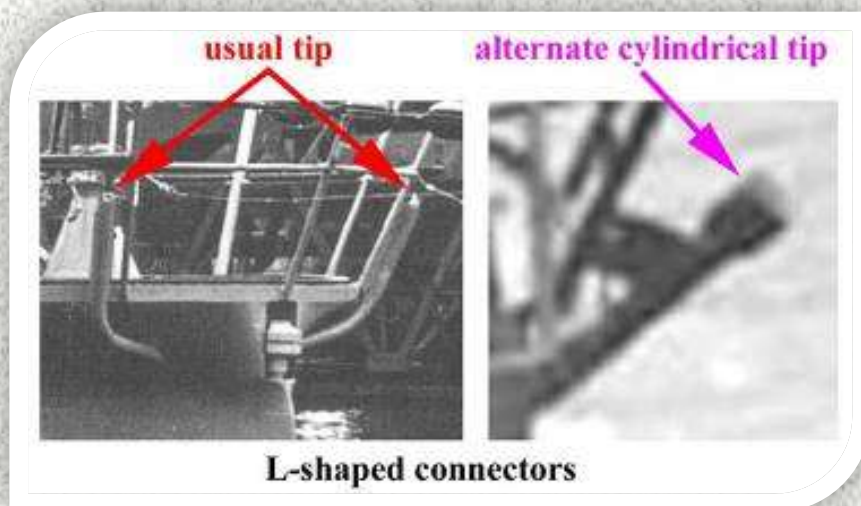
circuiting on the metal conning tower.

The earliest *Germaniawerft* boats (U 93 - U 98) were different from the other early VIICs in respect to their radio inlets. They did have the radio inlet aerial at this location, but the large surrounding hole around the inlet was not present on these particular boats. This style of inlet was also used on the VIAs and early VIIBs.

Almost all of the VIIBs had the old style of inlet. One exception was U 87, which was the very last VIIB to be built. Another exception is in respect to U 52: this boat was built with the old style of inlet but was modified to the new inlet at some stage.

U 93 – U 98 rear radio aerial inlet - The majority of VIICs had two L-shaped connectors which ran parallel to the two vertical railing stanchions either side of the rearmost stanchion. The bottom of the connectors entered the tower beneath the rear of the tower floor, while a very thin wire ran from the top of the connectors to the jumping wires above. These L-shaped connectors were insulated conduits which prevented the wires from short circuiting on the metal conning tower. There were slight variations in their style – most had a pointed top while some had a cylindrical top.

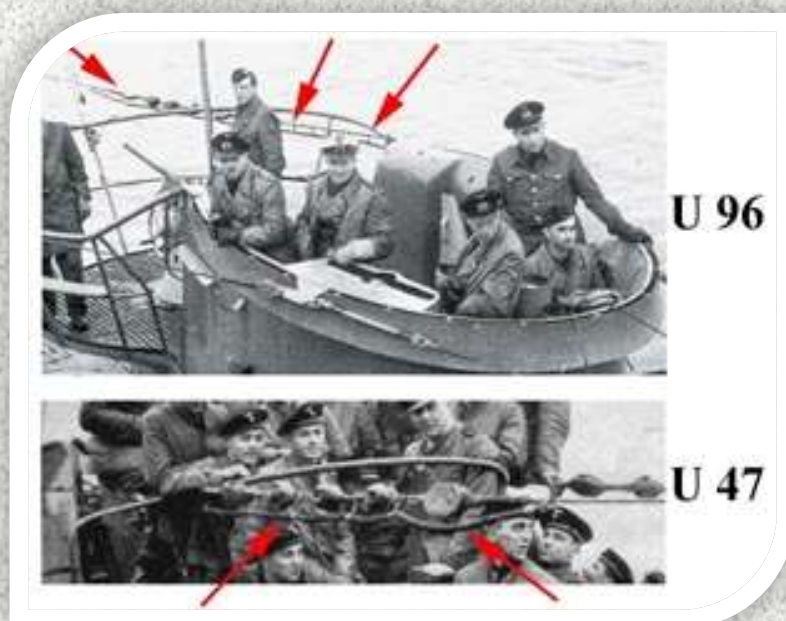
U 93 - U 98 were different to most VIICs in that they did not have the L-shaped connectors at the rear of the tower. The absence of L-shaped connectors is an excellent way of identifying a VIIC between the U 93 - U 98 range.



Left (C20a & C20b): Photos showing the position of the connectors and the two different styles of tip. The VIAs, early VIIBs, and the very earliest VIICs (U 93 - U 98) did not have these connectors.

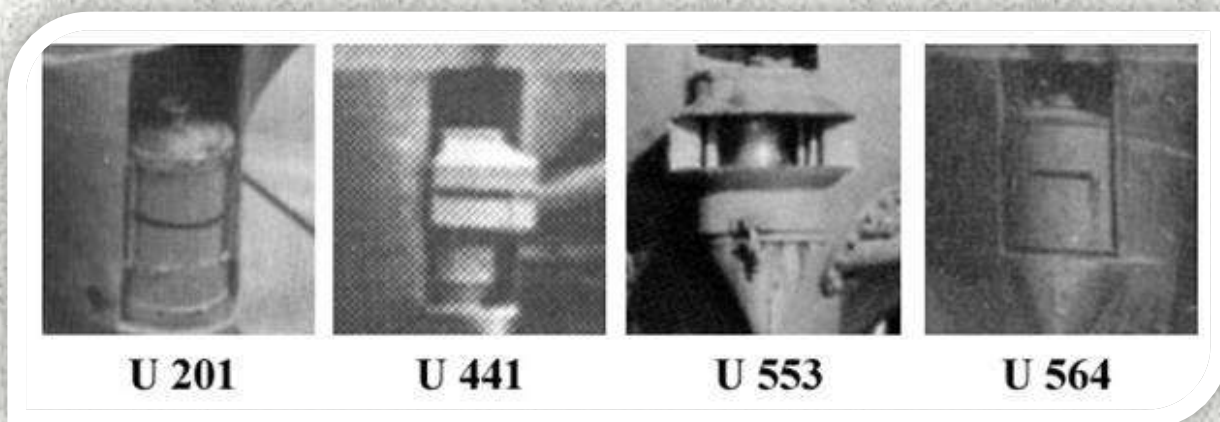
Below (C21a & C21b): The red arrows point to the extra wires on the VIIB U 47 and the VIIC U 96.

U 93 – U 98 extra wires - There was a third difference evidenced on U 93 - U 98. Once again this was a feature left over from the VIAs and early VIIBs. On the port jumping over the rear deck, there were additional wires in front and around the insulator blocks. On the photos below, the red arrows point to the extra wires on the port jumping wires of U 47 and U 96. The later VIIBs and other VIICs did not have this feature.



Navigation lights

Rear lights – The rear navigation light on the VIIC tower was located directly at the rear, just below the railings. There were several different styles of rear light on VIICs.



Above (C22a-C22d): The light on U 564 is very similar to the U 201 light. The difference is that the U 564 light has the recessed area farther down. The light on U 553 (which also featured on U 552) is completely different, as is the U 441 light.

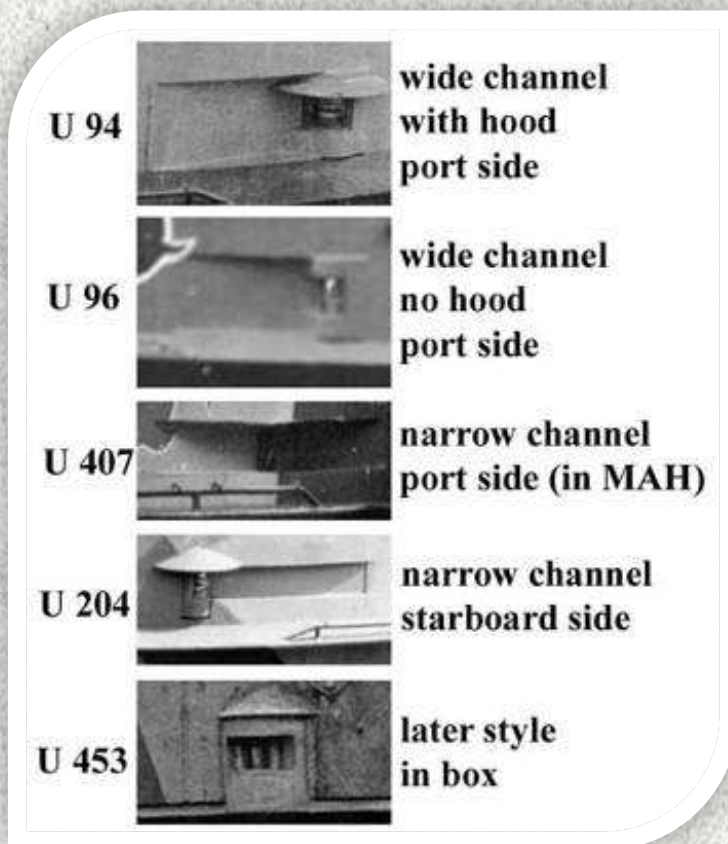
Below (C23a-C23e): The side lights on various VIICs.

Side lights – The other two tower navigation lights were located on either side of the tower, above the spray deflector. The channel at the front of the lights allowed light to shine forward. Once again there were different styles on VIICs.

Boats which did not have a MAH had a wide channel (wide in height). Most boats with a wide channel had a hood on top of the light (such as U 69, U 94, U 552 and U 558) but a few other wide channel examples (such as U 93 and U 96) did not have a hood on top.

The VIICs which did have the MAH had a channel that was much thinner in height. These examples did not have an appreciable hood on the port side (due to the MAH) but did have a hood on the starboard side.

There were several different styles on mid-to-late war boats, some of which were encased within a protective box. Sometimes the lights on late war boats had to be moved farther forward as certain other features interfered with the position of the lights.

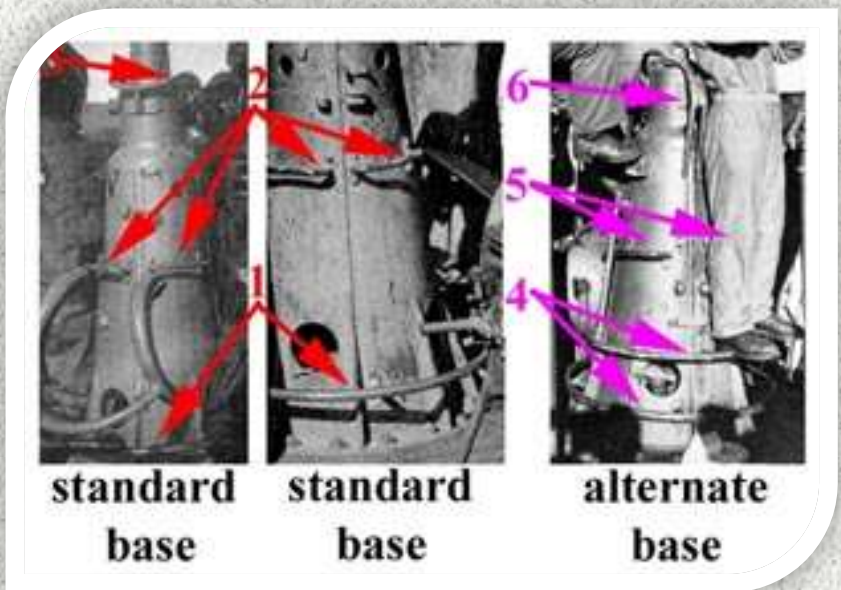


Attack periscope base

There were some differences in the railing bars on attack periscope bases.

Standard base - Most boats had one horizontal bar (number 1 above) which went all the way around the base, close to where the base met the floor. Note that U 201 was unusual in that its lower bar was modified to a step at some stage. There was also a pair of foot long horizontal bars (2) located around about halfway up the base; crew members could

grip these when they were standing on the lower bar. At the top was a bendy wire (3) that could also be gripped by the crewmen.



Above (C24a-C24c): Views of standard base and alternate base.

Alternate base – A few boats such as U 552 had a different style of railing bars on their base. There were two bars (4) near the floor, and two foot-long bars (5) halfway up. There was also a totally different railing bar at the top; this featured two vertical bars running parallel to one another (6) that were joined near the top.

An order was issued on the 26th September 1940 to add a mounting plate for the signal headlamp to the aft end of the attack periscope base.

Diesel exhaust outlets

For details of diesel exhaust outlets please refer to “Type VIIC Free-Flooding Vent Patterns” article.

S-Gerät

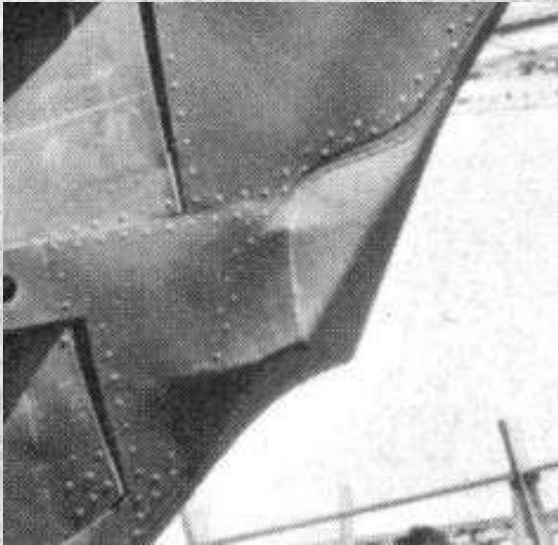
The main reason that the VIIC was developed from the VIIB was due to the S-Gerät (*Sonder-Gerät für aktive Schallortung* or “Special equipment for active sound location”). There was not enough space in the VIIB for this active sound equipment. So a lengthened version of the VIIB – the VIIC – was designed to house the set.

This active sound equipment was not available by the time the earliest VIICs were launched. But a bow device was fitted on the stem in readiness for when the equipment became available. The order to install this feature was placed on the 11th October 1940.

However, in time it was decided that the VIICs would not be fitted with the S-G internal equipment after all. An order to remove the equipment was placed on the 24th April 1942. Rather than removing the bow device altogether, the boats with an existing bow device had this feature blanked off. Later boats would have no bow device on the stem at all.



Above (C25): The S-Gerät bow device (S-G) on the stem of U 559.



Left (C26): U 228 in the summer of 1942, with a blanked off *S-Gerät* bow device (S-G) on the stem.

Below (C27): A photo of U 551 on the day it was launched, 14th September 1940. This proves that this *Blohm & Voss* boat did have the S-G bow device.

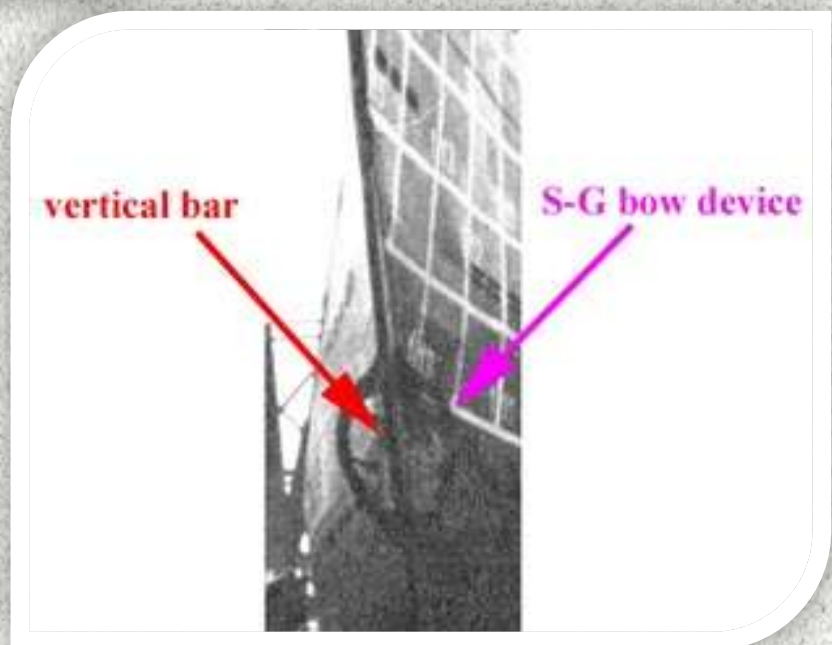
Some early VIICs did not have the S-G bow device at all. The earliest VIICs built at *Germaniawerft* (U 69 - U 72, U 93 - U 98) had lower net cutters when launched, but not the S-G. Certainly this was the case with U 70. In contrast, the early *Blohm & Voss* boats such as U 552 did have the S-G bow device.

In the photo to the right there is a vertical bar running through the S-G. As this is the position occupied by the lower net cutter, it looks at first glance that this is a lower net cutter. It would seem nonsensical to put a net cutter in front of an active sonar detection device. But the sonar was not active at this stage - the internal S-G equipment was to be fitted at a later date. Could this really be a lower net cutter **and** the S-G bow device, with the intention being to remove the lower net cutter when the internal S-G equipment became available?

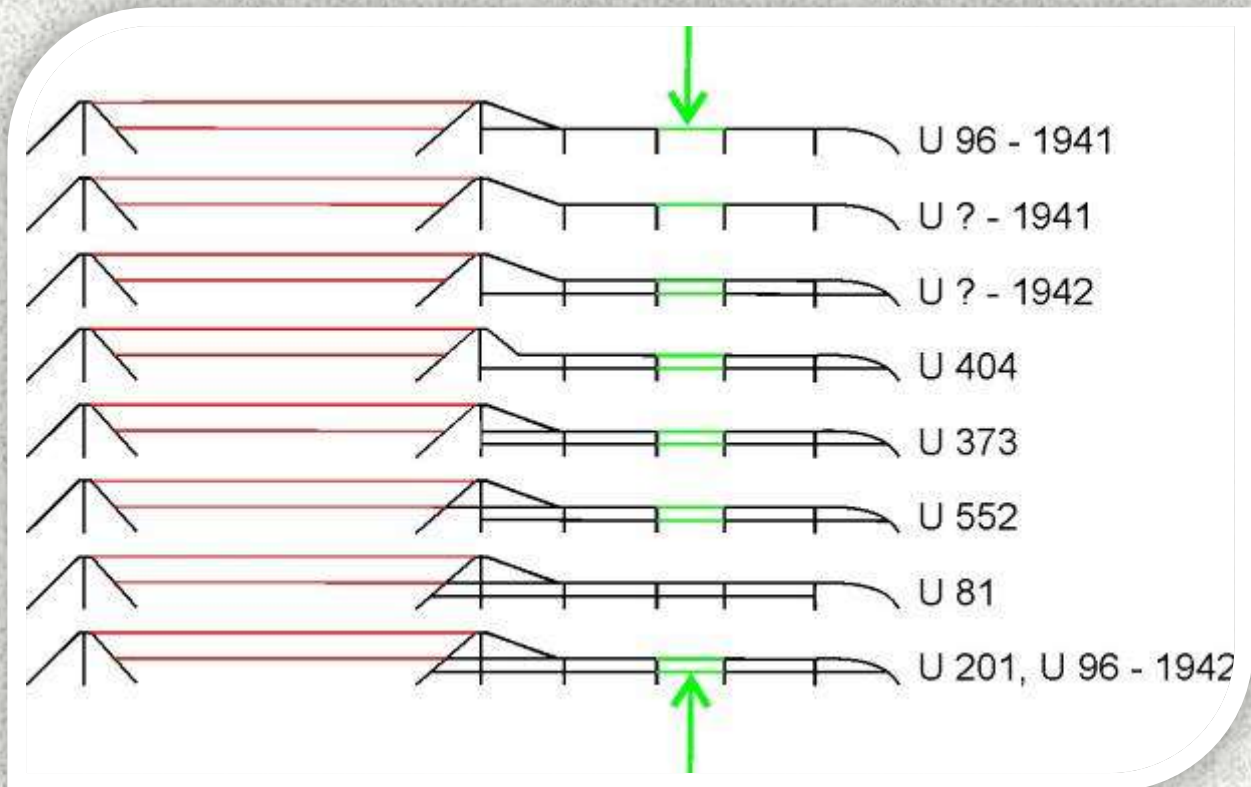
The puzzle may have a much simpler explanation. The vertical bar may simply be a removable guard to protect the stem from damage during the launch.

Early VIIC deck railings

The development of the VIIB deck railings (discussed earlier in the article) was continued into the VIICs. The very first VIICs, such as U 69, U 94 and U 96, all had the style shown in the top of the drawing below –



Type VII U-Boat Modifications



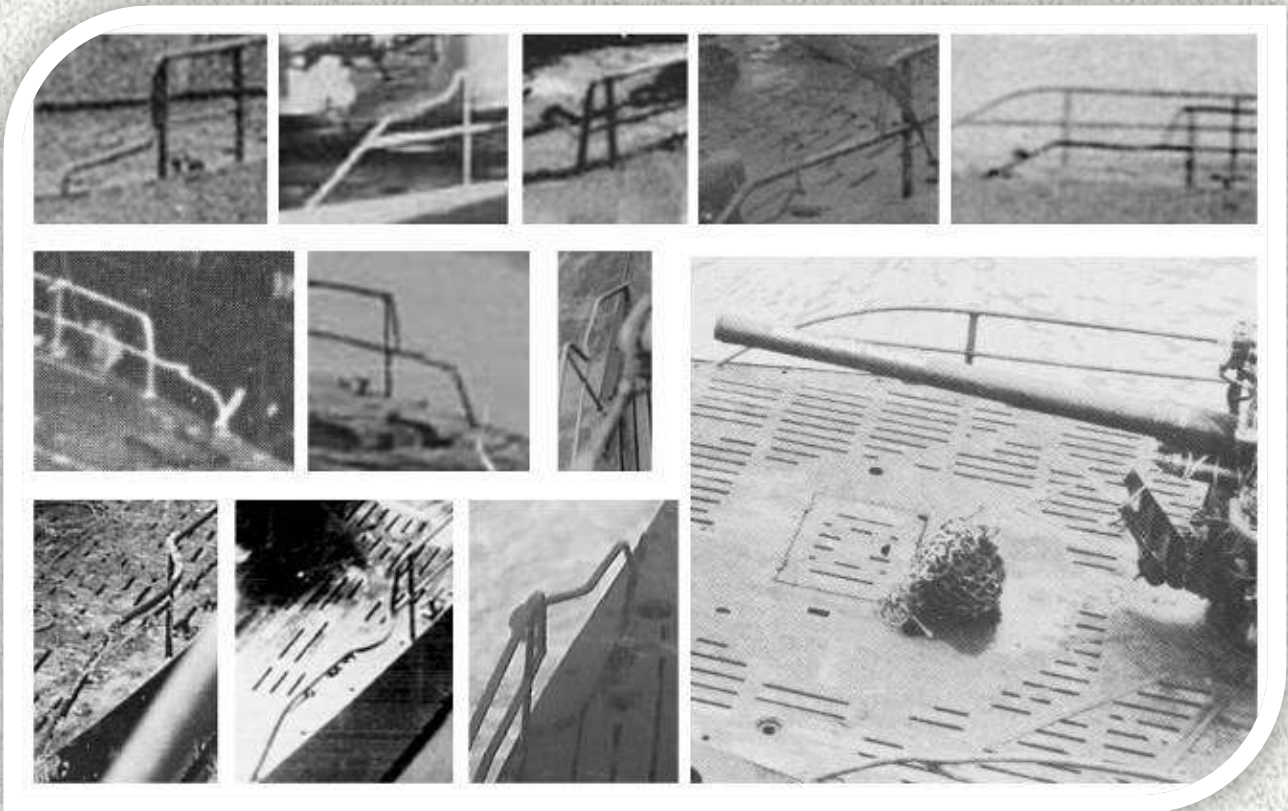
Above: A rough sketch of the starboard railings evidenced on early VIIC decks. The red lines are the wires which extended from the front to the aft railings. The green lines are the removable bars, which were discussed in the VIIB section.

On the 3rd February 1941, an order to introduce an extra horizontal bar at mid-height was issued. The drawing above shows the effect of this order.

We can also see that there were many different arrangements with respect to the bars at the rear of the front set of railings. The most usual style was arguably the U 201 style at the bottom of the drawing.

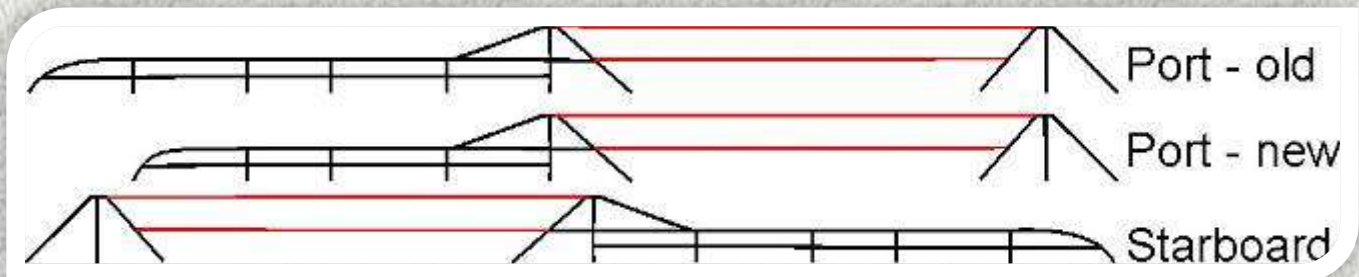
Some boats did go to sea with the removable bar (shown in green above) missing. This is evidenced by photos of U 204 and an early U 552, both of which have the bottom bar removed. Other photos of U 552 returning from an early patrol even show both bars missing.

A strange modification was made to the forward port railing on a number of boats. This was made only to the forward port railing, and not on the starboard side. The front bar on the port side was changed to a variety of different shapes. Many boats, including U 84, 201, 203, 276, 315, 333, 334, 380, 405, 427, 432, 466, 552, 570, 584, 596, 608, 612, 617, 735 and 755, had this strange misshapen bar. Some were launched with this feature, while earlier boats such as U 201 and U 552 had their original normal bar altered to the strange shape.



Above (C28a-C28l): A collage showing the misshapen forward port railing on a number of VIICs.

Below: The alterations made to the port railings on U 552. Modellers should bear this in mind if depicting the boat in 1942.



The large image on the bottom right of the collage above is of U 552. Early in the boat's career it had a normal port railing. At some point the port bar was altered to the arrangement that can only just be seen above. If we compare the front of the starboard and port railings to the flooding holes on the deck, we can see that the port side did not extend as far as the starboard side. This is demonstrated in the drawing below.

Other early VIIC modifications

Wooden strips - Unfortunately for the lookouts, the series of vertical strips running around the tower bulwark were not heaters to warm their hands. Rather they were wooden strips which prevented the lookouts from sticking to the bulwark sides in icy conditions. The VIAs, VIIBs and the very earliest

VIICs (such as U 94) had only a few shorter-length wooden strips with rounded edges on the tower bulwarks; these did not extend all the way around the bulwark.

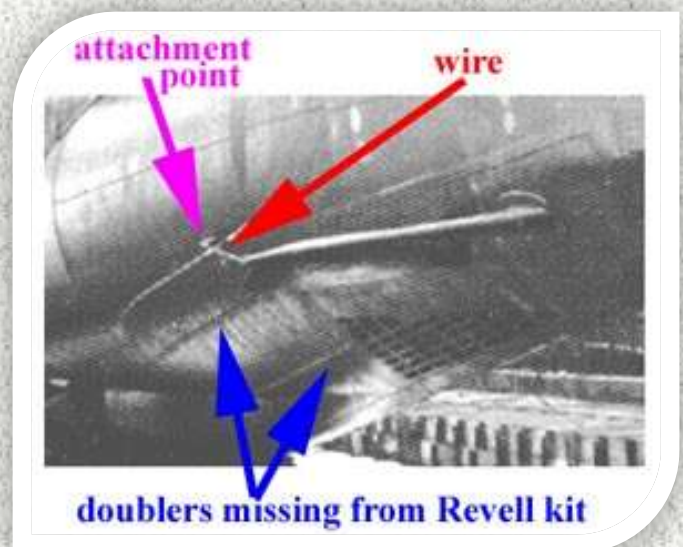
An order was placed on the 24th July 1941 to line the bulwarks with wooden strips. Sometimes the wooden strips also featured on the inside of the air trunks. A few months later, on the 6th December 1940, an order was issued to add the wooden strips to the periscope bases. The wooden strips were also added around the UZO.

MG34 – In 1942 some boats had mounting plates fitted to the top edge of the tower bulwark. These allowed for 7.92mm single MG34 machine guns to be mounted on the top of the bulwark edge. Usually there was one MG34 but up to three machine guns are evidenced in period photos. On rare occasions a twin MG34 was used.

Extra tower railings - On a few boats, such as U 136 and U 441, there were extra vertical railing bars on the side of the tower. These allowed crewmen easier access when they climbed up the tower sides.

KDB - The *Kristalldrehbasisgerät* (KDB, crystal base instrument) was a rotating T-shaped device on forward deck. This could be extended or retracted into the deck. Pre-war boats often had a canvas bag over this device for protection. The order to remove the KDB was placed on the 24th April 1942.

Foreplane tensioner wire - On the earliest VIICs a wire ran from the edge of the foreplanes to the pressure hull. Of interest here is that the position where the wire entered the hull is incorrect in several plans. The magenta photo below shows the true position -



Above (C29): The blue arrows point to two doublers (horizontal strengthening strips that were added to the hull casing for extra strength). These two doublers, and the two on the other side of the hull, are missing from the Revell kits. The magenta arrow points to the true location of where the foreplane tensioner wire entered the pressure hull.

U 404 – An object featured on the upper part of the front of the tower, just offset to port. This was not part of a *schnorchel*.

U 453 – This Mediterranean boat had an indentation in the lower torpedo doors.

U 600 – This VIIC had a few strange features, and may have been used as a test bed. The top of the air intakes had a rectangular flange and the forward aerial inlet was the old U 93 – U 98 style. There were additional wooden strips on the inside of the tower; these had a horizontal orientation rather than the usual vertical orientation. A shelf was added to the front of the inside of the tower. Of particular interest is that a glass/Perspex windscreen about six inches in height featured at the rear of the shelf.

Part IV - Mid-to-late War Type VIIC Modifications

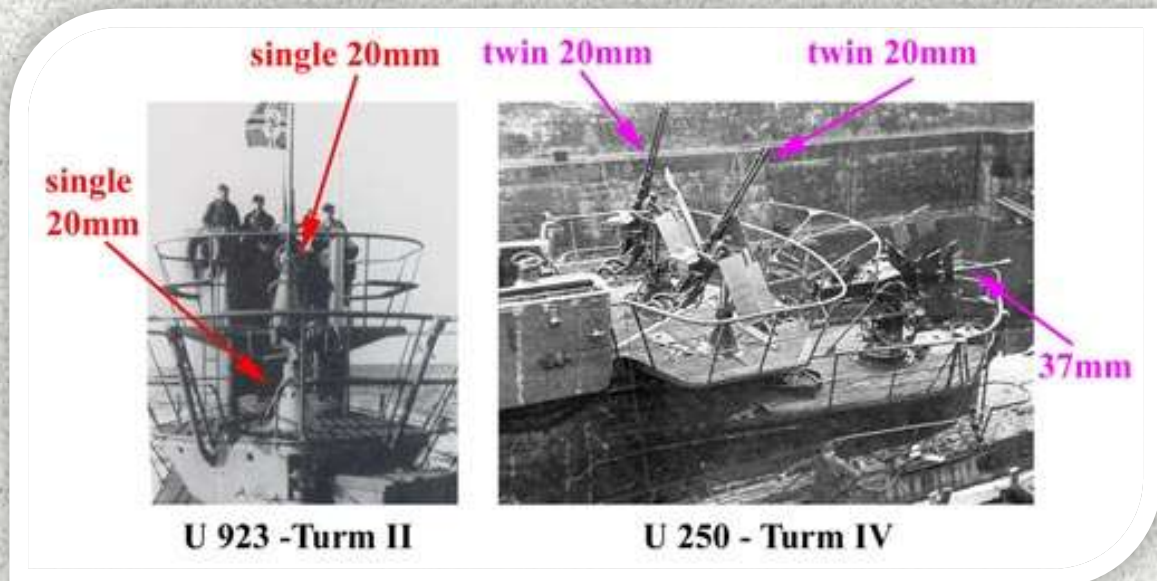
Tower

Turnm II - The tower on the early VIIC Revell kit is the standard early tower that was present on all early VIICs. This tower was known as Turnm 0. The Turnm 0 towers began to be modified to Bridge

Conversion II (known as Turm II) in December 1942. Turm II featured two single 20mms. One single 20mm was on the upper platform behind the bridge. The other single 20mm was on an extra lower platform; the wooden planks on this lower platform were arranged in a circular shape around the 20mm.

It has been said that the wintergarten refers specifically to the lower platform on a Turm II or Turm IV bridge. This would mean that the upper Flak platform was not the wintergarten – only the lower platform was. However, at present the upper platform (and also the rear of the tower on an early Turm 0) is often referred to as the wintergarten. Whether this is technically correct or not, the usage of the term wintergarten to Turm 0 is now widely accepted.

New railings were added on the edges of the deck near the rear of the new wintergarten platform. In addition, two watertight ammunition containers were fitted to the front end of the lower platform.



Turm IV – Turm II was only an intermediate solution until suitable armament was available. When such armament became available in 1943, VIIC towers were modified from Turm II to IV. The early Turm IV featured a pair of twin 20mms (mounted side by side) on the upper platform, and a quadruple 20mm (*Vierling*) on the lower platform.

Above (C30a & C30b): A comparison between a Turm II and IV tower. Note that the U-numbers were not numbered consecutively. This was done on purpose to disguise the true number of boats coming off the German slipways. U 552, for example, was launched **more than three** years before U 250. U 923 was launched early enough (just) to have a Turm II but would have later been converted to Turm IV.

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

The process of modifying existing towers to Turm IV began around the spring of 1943 or so. By August 1943 no boat was allowed to go on operations without a Turm IV tower.

In late 1943 an automatic 37mm gun became available. This single 37mm replaced the quadruple 20mm. A number of boats were fitted with the 37mm by the start of December 1943.

This combination of two twin 20mms and one 37mm became standard for all the VIICs and VIIC/41s until the end of the war. At the very end of the war some boats did exchange their 37mm for a twin 37mm (on a single mount).

Watertight ammunition containers were fitted to both platforms. There were normally three on the lower platform (two at the front and one at the rear) and two on the upper platform.

Additional life-raft containers were fitted to the rear edge of the lower wintergarten platforms. These containers looked like two large circular bulges.

A lattice mesh grill was fitted to the bottom half of some tower railings. This extended from the floor up to the horizontal railing bar. On some of these mesh grills, an additional perforated steel plate was present up to a height of around six inches.

A Turm IV tower features on Revell's VIIC/41 model. This has lead some modellers to assume, quite understandably, that the Turm IV was specific to the VIIC/41s. This is not so. The VIIC/41s did have the Turm IV. But the VIICs that were lucky enough to survive until mid-1943 were modified from Turm II to Turm IV.

Nautilus Models make a very useful resin/PE Turm IV conversion set. Although the replacement tower quite clearly has two twin 20mms (making it a Turm IV), it has been marketed as a Turm II.

Mittelmeerturm - A number of VIICs which served in the Mediterranean Sea between August 1942 and September 1943 were fitted with a *Mittelmeerturm* (Mediterranean tower). Noticeably longer than the standard early VIIC Turm 0, this tower featured two twin 13.2mm Breda machine guns (side by side in pressure tight pods) and a single 20mm behind.

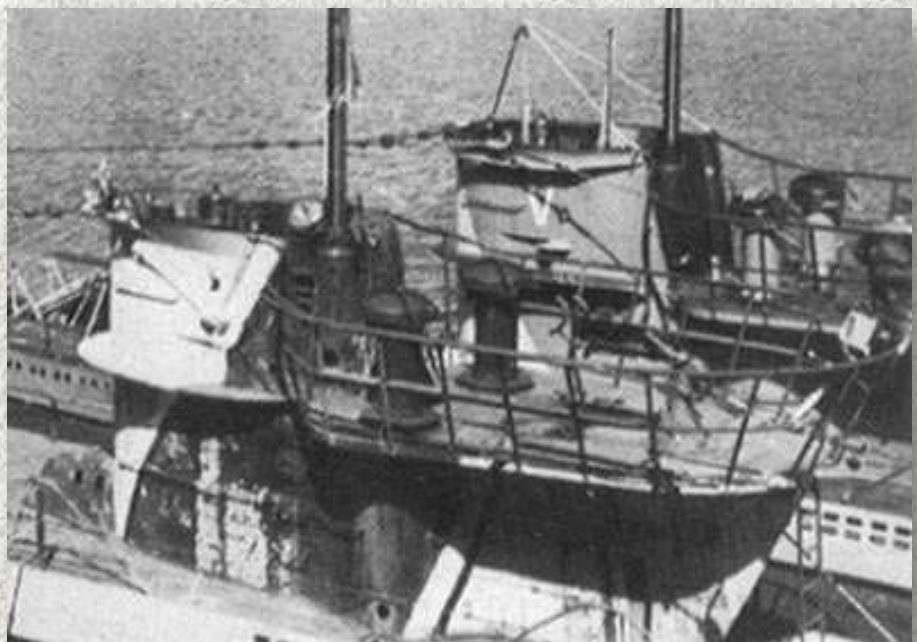
Two excellent photos of U 596 with a *Mittelmeerturm* can be seen on page 8 and 9 of edition 3 of the magazine *U-Boot Im Focus*. The magazine states that the tower was also known as the La Spezia conning tower as the conversion took place at a shipyard at this base. An assessment of the patrol history of the Mediterranean boats correlates with this statement. All the boats serving in the Mediterranean Sea between August 1942 and September 1943 did put into La Spezia at some point. They would often put into this port at the first opportunity after passing through to the Mediterranean. Or, if the boat was already serving here in late summer 1942, the boat would visit La Spezia to have the tower altered.

The following VIICs definitely had a *Mittelmeerturm* - U 81, U 83, U 443, U 410, U 443, U 453, U 561, U 565, U 596, U 616, U 617 and U 755. So too did the VIIB U 73.

The following VIICs did serve in the Mediterranean Sea between August 1942 and September 1943, and did visit La Spezia – U 77, U 97, U 205, U 303, U 331, U 371, U 375, U 380, U 407, U 414, U 431, U 458, U 559, U 562, U 593, U 602, U 605 and U 660. It is likely that these boats did have the *Mittelmeerturm* after they visited the La Spezia shipyard.

Flak boats – A few boats received much heavier armament in the hope they could fight off enemy aircraft. Some even had a platform in front of the tower.

Below (C31): The VIIB U 73 and VIIC U 561 at La Spezia on the 5th September 1942. Both boats have the *Mittelmeerturm*. The two large black objects are the pressure tight containers which housed the 13.2mm Breda machine guns. Note that the trailing edge of the tower, and the ladder behind.



Armoured boxes - Armoured boxes were fitted to the towers to protect lookouts from aircraft fire. The order to fit these boxes was issued on the 4th June 1943. Sometimes there would be one box, while on other boats there was a box on either side. Generally the port box was to house one crewman, while the starboard box was to house five men.

The design of the boxes differed between boats. Some boxes had round edges, others had sharp edges. The port box was usually farther forward than the starboard box. Given that the boxes had intruded upon the space that the navigation lights had previously assumed, the lights were usually moved inside their own small protective boxes and positioned directly ahead of the armoured boxes. In the photo of U 667 above, the boat does not appear to have any side navigation lights at all.



Above (C32): U 667 in autumn 1943, with an armoured box on either side of the tower. The port box has rounded edges while the starboard one has sharp edges. Some boats had armoured boxes and armour plating.

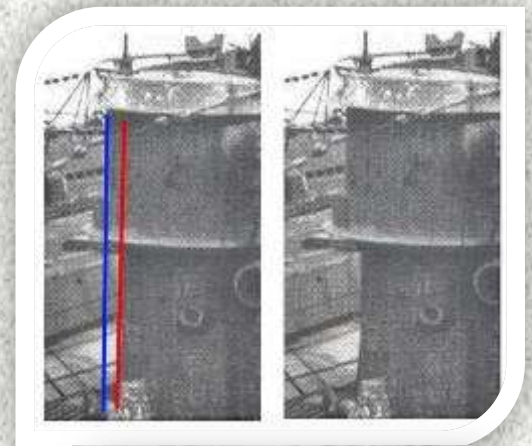
Below (C33): The blue line on the image below shows how far the top half extends, with the red line showing how far the bottom half extends. This discernable difference was due to the armour plating added above the spray deflector.

The excessive weight of the boxes reduced the stability of boats in high seas. As a result an order to remove the boxes was placed on the 30th October 1943. However, some boats did retain the boxes long after the order was issued.

Armour plating - Armour plating was added to the top half of the front face of the late war towers. This feature did last until the end of the war.

The addition of the armour plating meant that the side navigation lights had to be altered. Another necessary alteration was in respect to the radio aerial inlet for the forward jumping wire. As this inlet was located above the spray deflector, it too had to be altered.

On early boats there were two holes (one of which was for a foghorn) below the spray deflector. On late war boats one or both of these holes was omitted.



Shelf near front of tower – Following an order placed on the 7th May 1942, a shelf was added to the front of the inside of the tower. The photo below shows an example of the shelf. The circular hole allowed the head of the sky periscope (see blue arrow) to protrude through the shelf. Some of these shelves were curved rather than flat, and were not quite as lengthy as the example below.



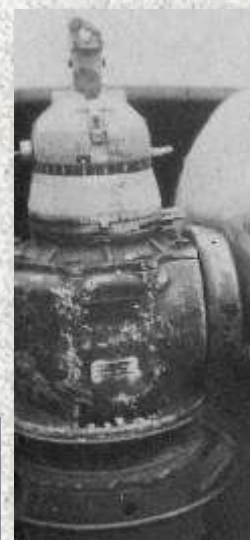
Right (C34): An unusual feature of this photo is that this particular boat has two jumping wires over the front deck. U 1192 was another boat with two forward jumping wires.

Late UZO – A different type of UZO was used in late war boats.

Deck

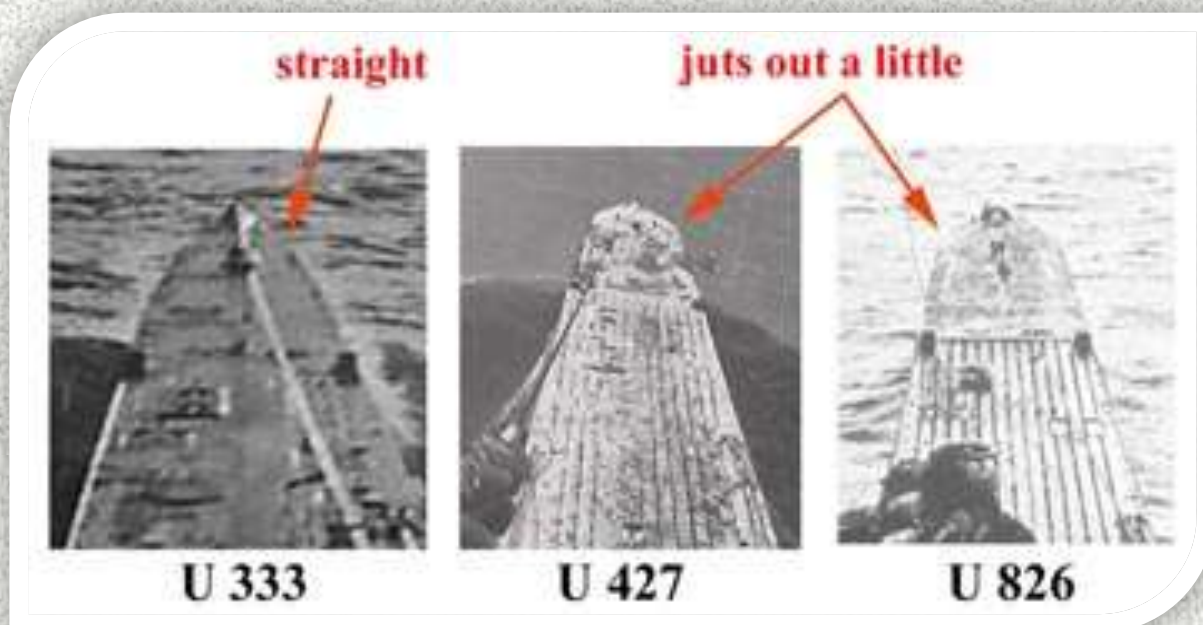
Atlantic bow - If we look at the particulars for VIICs and VIIC/41s we see a difference in length between the boats – the VIIC/41 was 13cm longer than the VIIC. The difference was due to the bow of the VIIC/41 being widened and extended. This extended bow was known as the Atlantic bow (*Atlantikstevan*).

Conventional theory holds that only VIIC/41s had the Atlantic bow. However, let us study the photos below closely. The image on the left shows the normal early VIIC bow profile. The middle and right images show the bows of U 427 and U 826. These boats have a different bow profile, one that is much wider towards the tip of the bow. These are certainly different to the profile of the bow of U 333 and the early VIICs.



Right (C35): The later style of UZO.

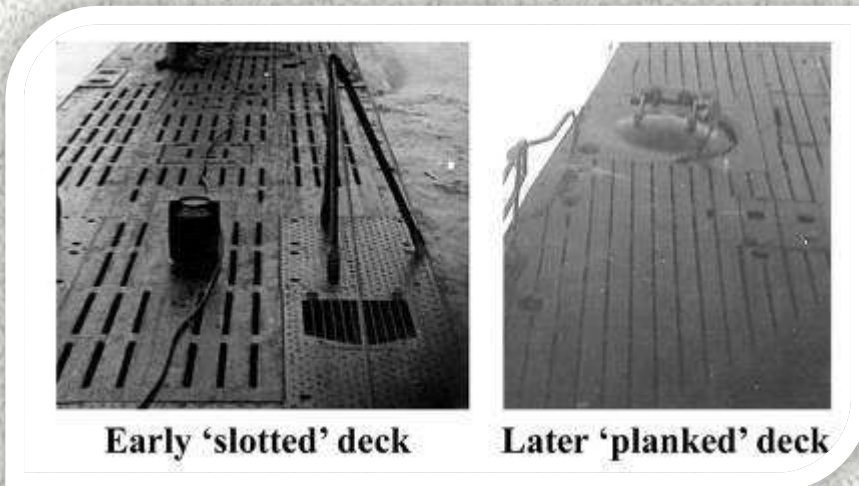
Below (C36a-C36c): A comparison of decks on three different VIICs.



However, U 427 and U 826 were **not VIIC/41s**. Rather they are later build VIICs. If an Atlantic bow had been added, then these VIICs would have been 13cm longer than earlier VIICs. Did U 427 and U 826 receive a full Atlantic bow? Or did they receive a bow modification that was wider in profile but not as long as a full Atlantic bow?

Although the introduction of the Atlantic bows was ordered on the 19th July 1941, it was not introduced until later in the war.

Slotted/planked deck - There is a major difference between the decks on the Revell early VIIC kit and the VIIC/41 kit - the early deck has slots while the later is arranged in planks. Some enthusiasts have quite naturally come to the conclusion that the slotted deck was particular to the VIIC, and the planked deck particular to the VIIC/41. This is not so. The change from slotted to planked is evidenced by photos of newly built boats in late 1942. The first VIICs to be built with the planked deck were launched as early as the autumn of 1942. However, as there were variations between shipyards, the introduction of the planked decks may have taken place a little after the autumn 1942 date in some yards.



Early 'slotted' deck

Later 'planked' deck

To surmise, the early VIICs had the slotted deck, the later VIICs (launched on or after autumn 1942 or so) had the planked deck.

While the other modifications would all be retrofitted to existing boats, the installation of the planked deck only took place on newly built boats. Changing existing decks to the planked arrangement was nowhere near worthwhile for the

expenditure in both time and cost. Therefore, boats which were launched with the slotted deck very likely kept this slotted deck until their demise.

The earliest VIIC/41, U 1163, was launched on the 12th June 1943. As this was many months after the first adoption of the planked deck, we can assume with reasonable certainty that **all** of the VIIC/41s had planked decks.

Following an order on the 27th April 1943, the 88mm deck gun was removed from all but the Mediterranean and Arctic boats. As the planked deck was in use many months before the removal of the 88mm, there were some boats which had the planked deck **AND** the 88mm.

Above (C37a & C37b): The difference between a slotted and planked deck is illustrated in these two photos.

Right (C38): U 235 in December 1942. We can see clearly that this VIIC has a planked deck. Of equal interest is that the boat still had a Turm 0 tower. At this particular time the Turm 0 had yet to be replaced by a Turm II.



Schnorchel - This system included a hinged mast, a clamp to hold the mast when upright, and air trunking behind. U 235, U 236 and U 237 were all damaged by an air raid in 1943. The three boats were fitted with a *schnorchel* in September and October 1943 and used to evaluate the device. The *schnorchel* began to be used on operational boats from November 1943, though only two VIICs were fitted by the start of March 1944. Due to limited availability a number of boats had to go out on patrol in 1944 without this essential device. A *runddipol* style antenna was usually mounted on top of the mast.

An essential guide to which boats were equipped with the *schnorchel* can be found at http://www.uboot.net/technical/schnorchel_fitted.htm This link details which VIICs were fitted with the *schnorchel*, and the month in which the device was fitted. The VIIC/41s are not included in this list.

The company OTW offers a 32nd scale model kit of the VIIC. OTW also offer the kit with a Turm IV tower, *schnorchel* and slotted deck. In this version the slotted deck has been altered to allow space for the *schnorchel*.

As few photos of VIICs with a Turm IV tower, *schnorchel* and slotted deck are in common circulation, a few have wondered which VIICs actually had this combination. A photo of U 953 in April

1944 unmistakably shows a slotted deck and *schnorchel* so we can be certain that this boat had these features. But which other boats also had this combination?

When we look at the list of boats equipped with *schnorchels*, we will see a number of boats launched before the introduction of the planked deck around the autumn of 1942. These include U 92, 211, 212, 251, 255, 256, 260, 262, 264, 267 and 953. Other *schnorchel*-equipped boats launched towards the end of 1942 may have had the slotted deck, and may be added to this list. As all VIICs that were built before the autumn of 1942 had the slotted deck, it follows that these boats had at one time the slotted deck and a *schnorchel*. This assumes that the deck was not changed from slotted to planked deck when the *schnorchel* was fitted. Given the cost and time expenditure, the shortages near the end of the war, and the fact that U 953 still retained the slotted deck when the *schnorchel* was fitted, it is likely that many or all boats also retained the slotted deck until their demise.

Since the *schnorchels* were fitted after the time when a Turm IV tower was made compulsory (August 1943), then it follows that these boats would all have had the Turm IV when they had the *schnorchel*.

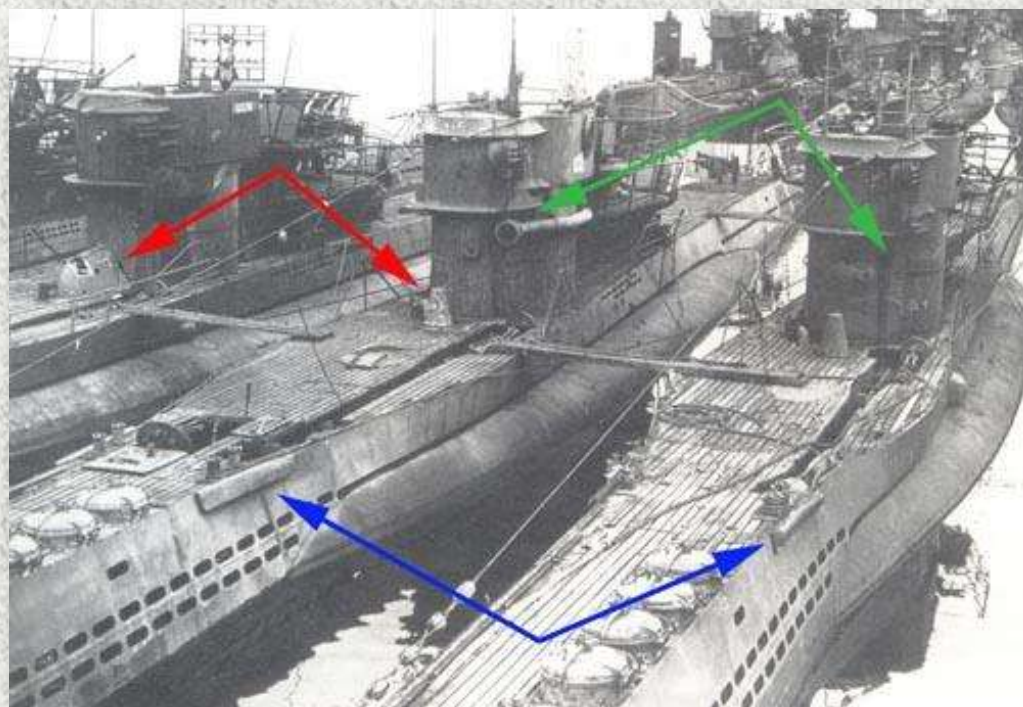


Left (C39): When the *schnorchel* was fitted a pipe was added on the deck, just to the port side of the tower. The blue arrow points to the pipe.

Below (C40): Several boats after the war had ended. The green arrows show the two main types of *schnorchels*; the air pipe that can be seen on the middle boat is not present on the boat on the right hand side of the photo. Another difference concerns the magnetic compass fairing, which is covered next. The boat on the left still has the old fairing, whereas the middle boat has the *Askania* magnetic compass fairing. The blue arrows point to a feature that featured on all late war boats. Note that there are railings on the deck on either side of the tower but none farther forward. Lastly, the middle boat has a hatch where the in the old 88mm location, while the boat on the right has no such hatch.

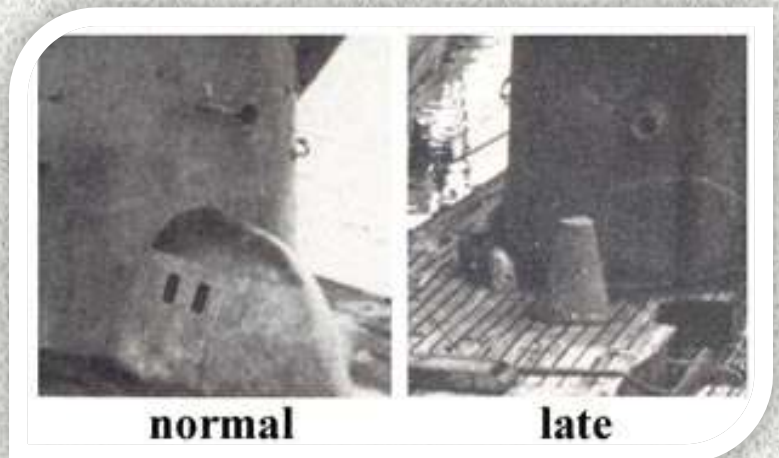
There were different types of *schnorchel*. One discernable difference is that some boats has a large air pipe in the horizontal position (just under halfway up the tower, on the port side). Other boats did not have this pipe.

A few boats had a wave deflector shield on the deck in front of the *schnorchel*.



Magnetic compass fairing - The magnetic compass was located inside a fairing at the front end of the VIIC tower (at the foot of the tower). A new style of housing was introduced in 1944. The new housing was entirely separate from the tower itself, and was located just ahead of the old location.

U 1172, which was launched at the end of 1943, did have the new housing in March 1944. But many boats still had the old housing in the summer of



1944. Most VIICs and VIIC/41s did have the new housing by the end of the war. But there were exceptions – U 278 and U 977 still had the old fairing at the cessation of hostilities.

The VIIC/41 U 995 had the old fairing when launched in July 1943. The museum boat U 995 currently has the new housing, which presumably was added at some stage in 1944 or 1945.

Note that on page 9 of *U-Boot Im Focus* Edition 2, it is stated that the new “Askania” magnetic compass was ordered for new boats on the 15th October 1942. The order may indeed have been placed on that date, with implementation coming at a much later date.

Above (C41a & C41b): The old magnetic compass fairing was very different to the late Askania fairing.

88mm – The 88mm deck gun and the base plate beneath the gun were removed from all but the Mediterranean and Arctic boats; this was authorised on the 27th April 1943. According the uboat.net, in July 1944 some VIICs of the 8th U-Flottille were refitted with deck guns when operating in the Baltic (source: <http://www.uboard.net/technical/guns.htm>). The strips on the deck around the 88mm were also removed.

Deck ammunition hatch – Early boats had a pressure-tight container for the 88mm ammunition on the port side of the forward deck; these were omitted when the 88mm was removed.

Life-rafts – The early VIICs had a dingy stowed in a pressure-tight container on the port side of the forward deck. When the deck gun was removed, this container was also taken away. A 5-man rubber escape dingy compartment was fitted at this stage to the location where the 88mm had been.

Life-rafts containers – Late in the war four life-raft containers (on occasion three) were fitted on the port side of the forward deck. U 963 even had two life-rafts on the aft deck.

Torpedo containers – Early VIICs had two torpedo containers under the deck casing (one under the forward deck and the other under the aft deck). A torpedo from each container could, albeit with some difficulty, be moved into the boat at sea. By mid-war the threat of enemy aircraft meant that such an operation was unnecessarily hazardous. As a result the containers were removed.

Rear jumping wire supports - There were two jumping wires over the rear decks. These were each supported by three stanchions near the stern. On the early boats there were two stanchions towards the inside, with one stanchion on the outside. The jumping wire was attached at the join of the three stanchions, which occurred directly over the two inside stanchions.

On later boats, there was a single stanchion on the inside, and two stanchions on the outside. These all leaned towards the outside, joining at a

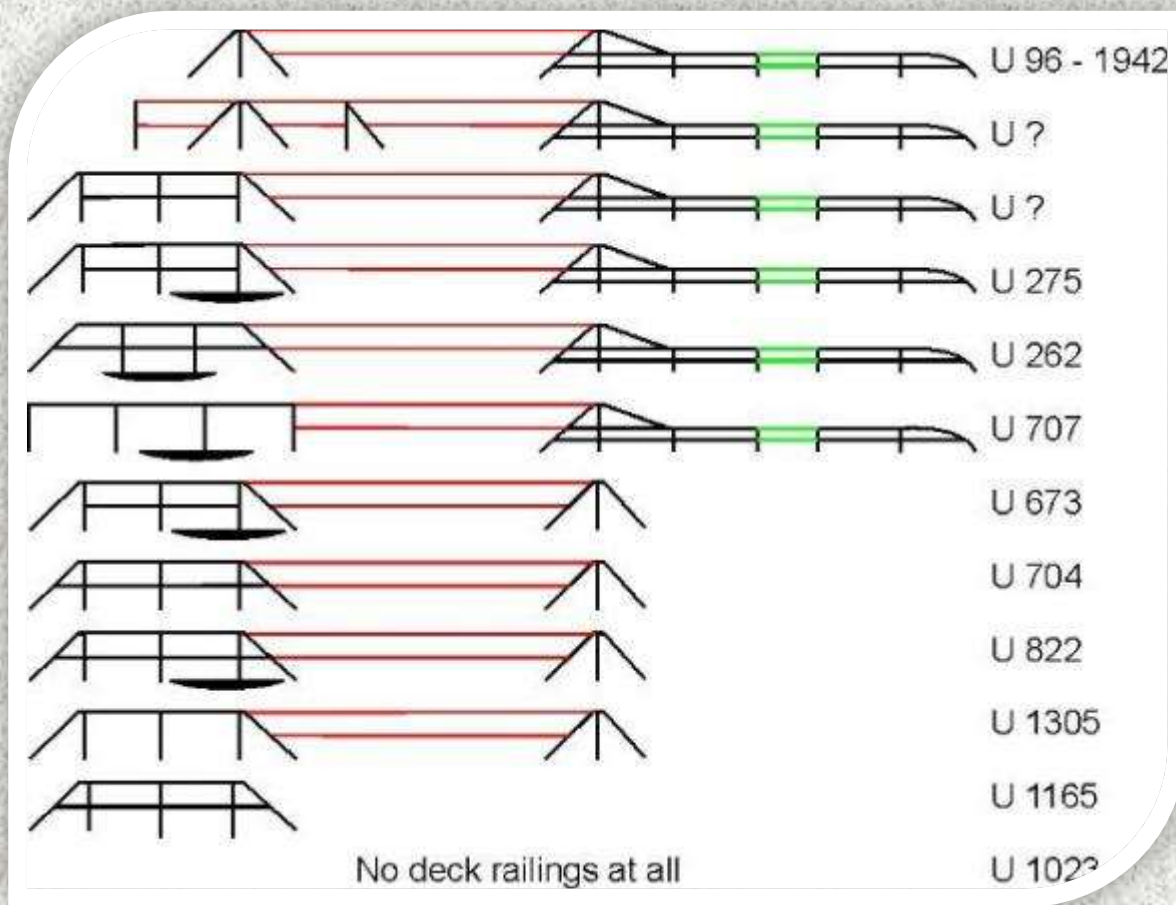


point that was outboard of the deck itself. This meant that the jumping wires were suspended farther outboard than before (roughly over the edge of the deck). As a result of the wires being farther outboard, crewmen could enjoy better movement around the aft deck.

Above (C42a & C42b): A comparison between early and late aft deck jumping wire supports.

Below: The starboard railings on late war boats. The modifications in the railings resulted from other changes to the boats; these included the fitting of lower platforms and the removal of the deck gun.

Mid-to-late war VIIC deck railings – The rear end of the Turm II and Turm IV towers were much wider than the original Turm 0 tower. As a result there was less space on either side of the tower. This raised complications for crewmen, who would be much more likely to fall overboard than before. To help prevent this, a new style of railing was introduced on either side of the lower wintergarten platform.



These railings lay at an angle, thus allowing crewmen the space to pass by. Some of these styles can be seen in the sketch below.

These new railings at the rear were introduced to new boats with Turm II and Turm IV towers. Most of the older boats retrofitted with Turm II and Turm IV also received the new railings. One exception was U 377, which retained the old triangular railings even when it had a Turm IV.

Since there was so little space for crewmen to pass by the sides of the tower, a small semi-circular platform was added to the sides of the hull casing. This was added to most, but not all, boats. On one boat which did not have this little platform (U 1165), two of the vertical stanchions on the rear railings actually entered the side of the hull casing, not the edge of the deck.

By late war the boats spend most of their time underwater, hiding away from patrolling aircraft. Crewmen did not frequent the deck as their colleagues had done during early war patrols. As there was no longer an 88mm, there was no longer a requirement for deck railings on either side of the 88mm. These were removed on most late war boats. All that remained were three bars on either side of the front of the tower. These bars were retained so that the two wires running parallel with the tower could be kept.

The continual development of the deck railings finally ended with the configuration on U 1023. This boat had no deck railings at all.

Radar

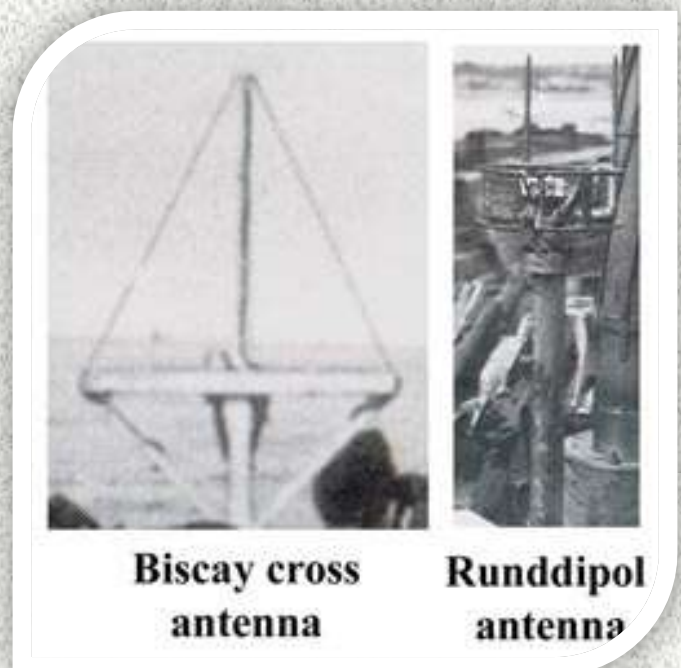
Radar warning receiver antenna - The first radar antenna visible on VIIC towers was the rudimentary Biscay Cross antenna for the FuMB-1 *Metox* radar warning receiver. This was an improvised structure made of wood and wire. It was mounted on a bracket on the attack periscope base, and brought into the boat every time the boat dived. All U-boats were to be given this equipment from late August 1942 onwards, though by December 1942 the whole fleet had not yet been fitted.

In 1943 Allied aircraft were homing in on emissions radiated by the *Metox* equipment itself. The Germans eventually realised this, and banned use of the *Metox* in August 1943.

A new radar warning receiver, the FuMB-9 *Wanz*, began to be fitted in August 1943. The antenna for this set was the *runddipol* – a cylinder enclosed in a wire mesh frame, with two dipoles pointing vertically out of the top. However, this new set also emitted signals that were picked up by Allied aircraft. The Germans once again realised this, and banned use of the FuMB-9 *Wanz* in November 1943.

Several more sophisticated radar warning receiver sets were fitted to U-boats until the cessation of hostilities. These sets either used the *runddipol* or a similar antenna. These antennas were located in different places – either just ahead of the attack periscope base, or ahead of the FuMO-30 antenna box on the port side of the tower, or sometimes inside the D/F loop.

Very late in the war a different antenna was used in conjunction with the FuMB-35 *Athos*.



**Biscay cross
antenna**

**Runddipol
antenna**

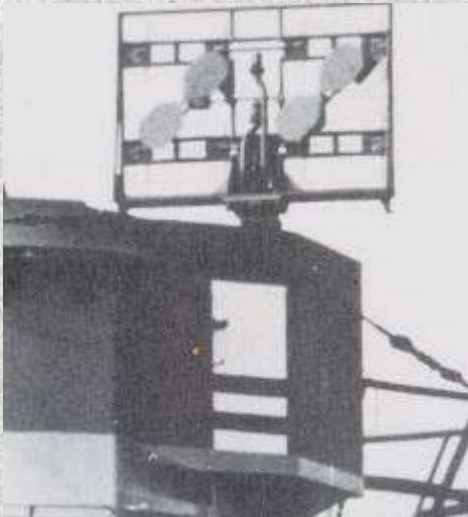
Above (C43a & C43b): Two well known types of antenna.

Radar antenna - The first U-boat radar set was the FuMO-29 *Gema*. The antenna consisted of two horizontal rows of 6 dipoles each, mounted at the front of the tower. A few VIICs operated with the FuMO-29 in 1941.

In 1942 the FuMO-30 was introduced. This used the same *Gema* set inside the boat but used a completely different antenna. The 12 dipoles were removed, and replaced with a new rectangular wire-mesh antenna. This was housed in a large box on the port side of the tower, exactly where the MAH had been. This new box had sharper edges than the MAH (which had been round in shape).

Now that the MAH had been replaced by the FuMO-30 box, the hydraulically extendable mast antenna (which had been located in the MAH) would have to find another home. The mast antenna was moved to starboard side of the tower, being attached to the D/F aerial loop. The order for moving the hydraulically extendable mast antenna occurred on the 5th August 1943.

The FuMO-30 was replaced by the FuMO-61 *Hohentweil*. The antenna for the *Hohentweil* was also rectangular and housed in the same box on the port side. This new antenna was fitted to U-boats from the beginning of 1944. Many boats were equipped by autumn 1944.



Left (C44): The FuMO-30 antenna raised above the purpose-built box on the port side of the tower.

Other mid-to-late war modifications

Aphrodite - Two hydrogen cylinders for the *Aphrodite* decoy system were housed in the FuMO-30 box at the port side of the tower. *Aphrodite* was ordered on the 5th June 1943, deployed in autumn 1943, and still in use by spring 1944. This was replaced by *Thesis*, which was stored internally.

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

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

Balkon-Gerät - This system consisted of 48 hydrophones in a round dome at the bottom of the stem. It was standard on XXIs but was fitted to some VIICs and VIIC/41s in 1944 and 1945. It does not feature upon the VIIC/41 kit.

Part V – Final Thoughts

Museum boat U 995

The VIIC/41 U 995 survived the war. Several years later, in 1952, the boat was commissioned into the Norwegian Navy. The boat served under the name *Kaura* (with the NATO number S309) until retirement in 1965. The Norwegian Navy removed the lower platform, leaving the former U 995 with no wintergarten behind the tower. This harked back to the early days of the VIIC when the boats had no

lower platform. Two other German U-boats, U 926 and U 1202, also served in the post war Norwegian Navy.

After her Norwegian service, U 995 was returned to Germany. By the end of the 1960's the exterior of the boat was in poor condition. During 1970 and 1971 the boat was restored back to what she looked like during her wartime Kriegsmarine service. By November 1971 the boat was looking much more like her former self, with a lower platform (wintergarten) in place once again. The *Balkon-Gerät* was still in place at this time. In March 1972 U 995 was transported to her permanent resting place at Laboe. The boat did not have the *Balkon-Gerät* during the transit, and this feature is not on the boat at present.

During the many years that have passed since her transit, the boat has lain outdoors at Laboe. In recent years some anti-corrosion measures have been conducted to combat the corrosive impact of the elements. These measures have made an impact upon the exterior of the boat. Some free-flooding holes have been replaced with steel plate, while other features have been changed.

These changes are evidenced by the walk-around photos of U 995 available in books and on the internet. As some of these photos show areas that are not visible in U-boat books and pictorials, it can be tempting to use the U 995 photos as primary reference material. However, given the fact that much of the exterior of U 995 was rebuilt in the early 1970's, and the anti-corrosion measures conducted in recent years, we must be **VERY** cautious if we are thinking doing so. The exterior of the current U 995 cannot be considered as prototypical. Many features look slightly different to those which featured on the boat when she was in her wartime prime.

Suitability of the Revell kits

Revell's early war Type VIIC kit (RV5015) has a Turm 0 tower, which featured on VIICs during 1940, 1941 and 1942 (and probably on some boats during the earliest part of 1943). So the tower included in the kit is suitable, without significant alteration, for Type VIIC U-boats at these time periods.

If modelling a boat which served in the Mediterranean between August 1942 and September 1943, it is likely that the Revell tower should be altered to the *Mittelmeerturm* tower. If depicting a boat in December 1942 or the early part of 1943, the Revell tower may have to be altered to the Turm II tower. If depicting a boat in the spring of 1943, conversion to the Turm IV tower may be required; this alteration will certainly be required from August 1943 onwards. To depict a VIIC from August 1942 onwards, some form of radar antenna should be fitted to the tower.

Revell's late war Type VIIC/41 kit (RV5045) has a planked deck, Atlantic bow, *schnorchel* and Turm IV tower. It has the regular style of magnetic compass fairing rather than the late one. This makes the model suitable for late war VIICs and VIIC/41s with the old magnetic compass fairing.

The Snorting Bull Insignia

Contents

- ⊕ Part I Original Bull Of Scapa Flow Insignia
- ⊕ Part II Snorting Bull On 7th U-Flottille U-Boats
- ⊕ Part III The Laughing Cow Of Lorient

Part I - Original Bull Of Scapa Flow Insignia

One of the most common of all U-boat *bootswappen* (insignia or emblem) was the snorting bull. The white outline of a snorting bull featured upon a large number of Type VIIB and VIIC U-boats. It was first used upon U 47 as the personal insignia of the boat's commander Günther Prien. After the loss of Prien in March 1941, it was then used as the official flotilla insignia of the 7th U-Flottille.

The origins of the bull can be traced back the night of the 13th/14th October 1939. On this fateful night, the Type VIIB U 47 penetrated the main Royal Navy base at Scapa Flow and sank the 29,150-ton battleship HMS *Royal Oak*. The legendary attack, which has been described as "the greatest submarine raid of all time," elevated the boat's commander Günther Prien to the status of hero in Germany.

U 47 returned to Germany from the Scapa Flow raid during the period between the 14th October 1939 and the 17th October 1939. During this time, an insignia consisting of a white outline of a snorting bull was painted on either side of U 47's conning tower.

Known as the "The Bull Of Scapa Flow" (*Der Stier von Scapa Flow*), the insignia would become arguably the most famous of all U-boat insignia.

Numerous paintings and illustrations depicting U 47 during the Scapa Flow attack on the night of the 13th/14th October 1939 include a bull on the U-boat's tower. However, as the bulls were applied during the return to Germany, these illustrations are erroneous.

The bull insignia was devised by U 47's First Watch Officer, Oberleutnant zur See Engelbert Endrass. The first of the three influences which prompted Endrass to produce the bull insignia was a comment made by the Second Watch Officer, Oberleutnant zur See Amelung von Varendorff, during the time U 47 had been cruising around on the surface inside the Scapa Flow harbour. The



Left (D1): The original snorting bull insignia on the starboard side of U 47's tower in October 1939. Above is Günther Prien, the boat's legendary commander.

young officer had just been chastised by Prien for taking a stroll on the deck without signing himself off the bridge. Upon reporting back to the tower, von Varendorff is supposed to have remarked, “Herr Kaleu, there is nothing wrong in this bullfighting arena; where are the war horses?” The second influence came from a character in a comic paper that was popular among the crew before the Scapa Flow raid. The character, *Harry Hotspur*, was a bull with smoking nostrils which pawed the ground. Lastly, it was felt that the insignia depicted the aggressive character and spirit of U 47’s legendary commander, Günther Prien.

With these three influences in mind, Endrass designed the bull on the way home to Germany from the successful Scapa Flow mission. Bootsman (Chief Petty Officer) Hans Sammann and Matrose Gefreiter (Able Seaman) Peter Dittmer enlarged the drawing and made a stencil from paper. Using this stencil, the white outline of a snorting bull was painted upon both sides of U 47’s conning tower.

Günther Prien, from whom the bulls on either side of the conning tower had been kept secret until they had been completed, was both surprised and pleased with the result. Both he and U 47 were thereafter popularly known as *Der Stier von Scapa Flow* – “The Bull of Scapa Flow.”

During the course of U 47’s career, the boat went into a shipyard for repairs after each patrol. In most cases the boat spent some of the refit time in dry-dock. The boat would usually be repainted during these refits, and start each patrol with a fresh coat of paint. The exception to this was when the boat was in the shipyard for only a short time; a fresh coat of paint may not have been applied in these circumstances.

When U 47 was repainted, the snorting bull insignia would also benefit from a makeover. Since

a stencil was not used when painting U 47’s bulls, each snorting bull would differ slightly from previous examples. With the photos that are available to us, we can be sure that there were at least 8 versions used upon U 47. Separate bulls were definitely present during patrols 2, 3, 6, 7, 8, 9 and 10.



Left (D2): This image was taken on the 6th July 1940, at the end of U 47’s successful 6th patrol. Beside the snorting bull is “66587to.” – the tonnage figure Prien believed they had sunk during the patrol.

Right (D3): The starboard bull at the start of U 47’s 9th patrol on the 3rd November 1940. The three final snorting bull versions were applied during refits in port. As we would expect, these versions are much neater renditions of the famous insignia than some of the earlier versions applied at sea.



Right (D4): The starboard bull at the start of the tenth and last patrol on the 20th February 1941. This version of U 47's snorting bull is the final one, which the U-boat sported when lost on the 7th March 1941.

Part II - Snorting Bull On 7th U-Flottille U-Boats

After Günther Prien was lost aboard U 47 on the 7th March 1941, the flotilla which U 47 had been assigned to - the 7th U-Flottille – issued a written order to the U-boats belonging to the flotilla to paint the snorting bull insignia on the towers. This order was issued by the chief of the flotilla Herbert Sohler. As a consequence, the snorting bull became the official flotilla insignia of the 7th U-Flottille. Any U-boat with the bull would therefore belong to that flotilla.

This order was intended to honour Prien, the legendary U-boat commander renowned for his daring penetration of Scapa Flow. News of his death was deemed to be such a blow to the German nation's morale that it was not announced until the 23rd May 1941. Although the official announcement wasn't made until this date, the 7th U-Flottille were clearly aware of Prien's demise soon after it happened. To prove this, one only needs to look at photos of U 69 returning from her 3rd patrol with a unique version of the bull adorning the conning tower. U 69's "bull," which shall be discussed later, was applied before the 3rd patrol commenced on the 5th May 1941. It follows that the order given by the 7th U-Flottille must have been issued some time before the official announcement of Prien's death to the German public.

Since the snorting bull was used on numerous U-boats, there were inevitably differences between the individual designs. Each time the boat was repainted a slightly different bull design would appear. Not only were there variances between the designs themselves, but the size and location on the towers also varied. Sometimes even the same boat had bulls of a different size and location over time.

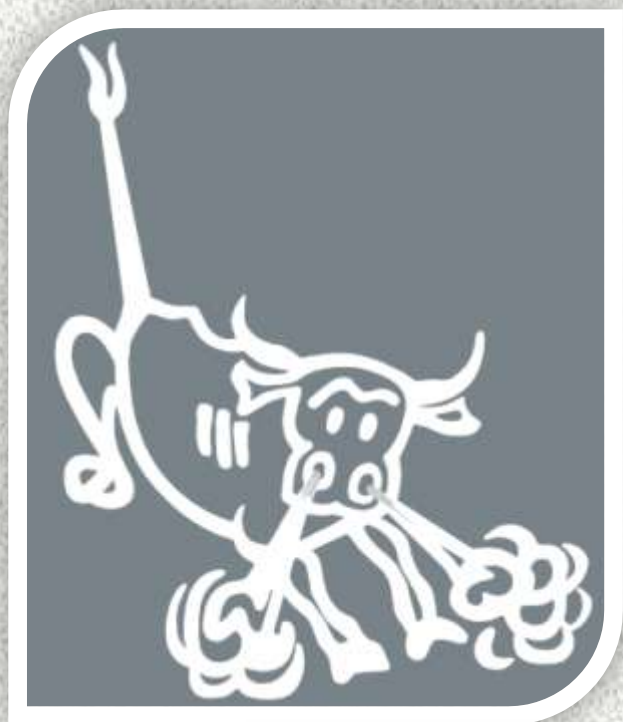
Usually both bulls faced forward. But there were exceptions: U 46 and U 93 both featured bulls which faced to the left. Many of the bulls were roughly the same size as the U 47 bulls had been, with some slightly smaller. But a number of boats had much larger bulls located towards the front of the towers. Some of the 7th U-Flottille boats had only one bull located at the front of the tower. In these cases a personal insignia often occupied the favoured position at the side of the tower.

Despite these various factors, the 7th U-Flottille bull designs were often quite similar. Many of these snorting bulls had the following characteristics –

- fat body
- straight tail
- a crooked line between the bottom of the tail and horn
- three lines within the body
- the body is depicted below the face
- only one hind leg

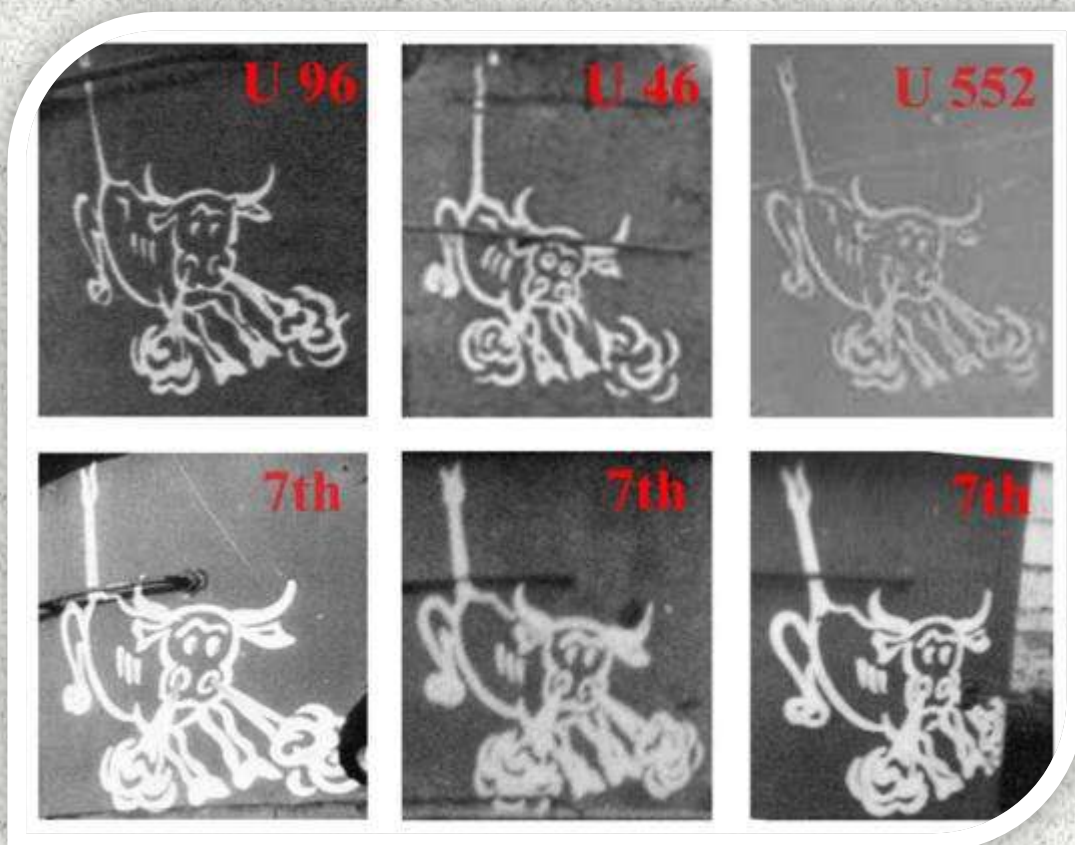


The Snorting Bull Insignia



Left: A drawing of the snorting bull used on some U-boats of the 7th U-Flottille.

Below (D5a-D5f): The top three bulls show some of the versions that were present on the famous 7th U-Flottille boats U 46, U 96 and U 552. The bottom three show the insignia on unidentified boats. The similarities in design and size between the bottom three suggest that a stencil was used to apply these bulls. Note that as these six images were taken at various angles to the tower, the proportions we see are



Many U-boats, such as U 48, U 94 and U 552, had the snorting bull flotilla insignia in addition to their personal insignia. Earlier in these boats careers, before the order to display the bull flotilla insignia had been given, these three boats sported only their personal insignia.

The Snorting Bull Insignia



Left (D6): The port side of U 552, commanded by Erich Topp. Since Topp's red devil personal insignia is at the front of the tower, the snorting bull has been positioned at the rear of the tower bulwark. A similar red devil and bull were present in the same locations on the starboard side.

Below (D7): The port snorting bull on a damaged U 46, commanded by Engelbert Endrass. The eyes of U 46's bulls were circles rather than dots. The starboard bull was unusual as it also faced to the left, just as the very first snorting bull design did.

When First Watch Officers received their own commands, they sometimes instructed that the insignia of their old boat should be painted on their new boat. Such was the case when Oberleutnant zur See Engelbert Endrass took command of U 46 on the 22nd May 1940. The copying of the bull insignia by Endrass is hardly surprising, given his part in the creation of the famous drawing. Endrass definitely used the bulls on U 46 as a personal insignia rather than a flotilla insignia. The order for boats of the 7th U-Flottille to adopt a snorting bull did not take place until after Prien's demise in 1941, long after U 46 had been prowling around with bulls on her conning tower.

After serving on U 46, Endrass took command of the Type VIIC U 567. The short propaganda film which was shot aboard U 567 shows that a particularly large pair of bulls adorned the boat's tower. Another interesting fact which can be ascertained from the film is that the crew of U 567 also wore snorting bull badges on their caps.



Right (D8): A large snorting bull being applied by stencil to U 567, commanded by Engelbert Endrass.

The Snorting Bull Insignia



Above left (D9): The snorting bull on U 593 differed from most boats. The white bull was imposed upon a black circle, around which was a white border. The personal insignia can be seen at the front of the tower.

Above right (D10): The one snorting bull, facing to the left, at the front of U 213's conning tower. The Type VIID U-boat was commanded by Oberleutnant zur See Amelung von Varendorff, who served as a Watch Officer aboard U 47 from patrols 2 to 9. When he assumed command of his own boat, von Varendorff used the snorting bull as his personal insignia.

Left (D11): A large bull insignia on the starboard side of a U-boat belonging to the 7th U-Flottille. Given the size and design of this insignia, the stencil used on U 567 may have been used when this bull was painted.

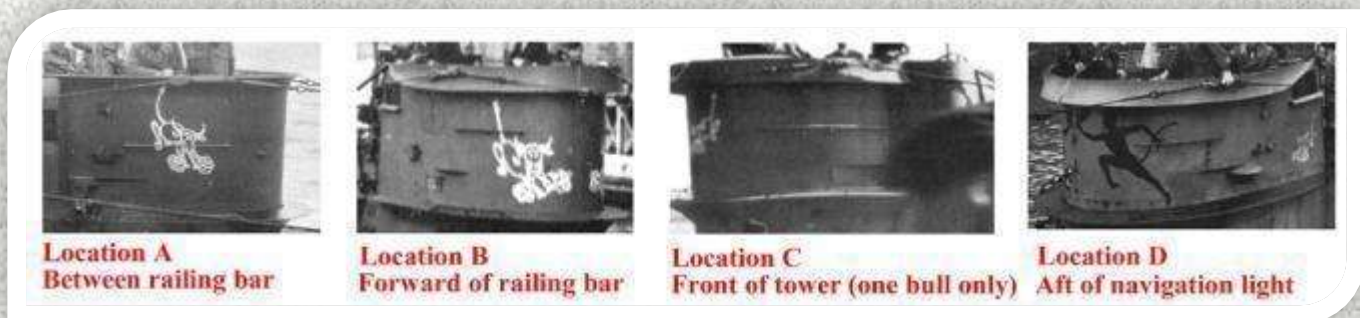
Below left (D12): Colour photos of U-boats with the snorting bull insignia are extremely rare. This shot shows a 7th U-Flottille boat arriving back from patrol at St. Nazaire in bright sunshine.

Below right (D13): Two U-boats of the 7th U-Flottille lying side by side.



The Snorting Bull Insignia

According to *U-Boat Emblems Of World War II 1939-1945* by Georg Högel, the following U-boats sported the snorting bull insignia at some stages in their careers: U 46, U 47, U 48, U 69, U 73, U 74, U 75, U 77, U 93, U 94, U 96, U 98, U 101, U 103, U 135, U 207, U 213, U 221, U 224, U 227, U 266, U 267, U 281, U 358, U 359, U 382, U 390, U 406, U 409, U 415, U 434, U 436, U 442, U 454, U 455, U 528, U 531, U 551, U 552, U 553, U 561, U 567, U 575, U 576, U 578, U 590, U 593, U 594, U 600, U 607, U 617, U 614, U 618, U 641, U 650, U 662, U 667, U 707, U 709, U 714, U 751 and U 976. Therefore, at least 62 U-boats sported the snorting bull insignia. At least 58 U-boats adopted the bull as



a flotilla insignia, while U 47, U 46, U 567 and U 213 adopted the bull as a personal insignia.

Above (D14a-D14d): A guide to the different locations on U-boat towers. Location D was often used if a personal insignia was present in the more normal location A or B.

The positions and size of the snorting bulls are given for the boats below. **All sizes are the normal size unless otherwise specified.** It was usual for both bulls to face forward but there were exceptions (U 46 and U 93). Note that the sizes and positions may have varied throughout a boat's career. The location codes A to D codes are explained above.

Snorting bull positions	
Boat	Position
U 46	Location A, the eyes were circles rather than dots, both bulls facing to left. At a later stage, when U 46 operated out of St. Nazaire, there were two large bulls in location A.
U 48	Located just below railing bar (location A) and 401623 tonnage figure. These bulls appeared only at the end of operational career on the 22 nd June 1941.
U 73	Bulls present at start of career in late 1940 in location D. They were removed soon afterwards when L-shaped air trunks were added over this location.
U 93	One bull in location A below railing bar, both facing to left.
U 94	Personal insignia on either side in April 1941. Then one bull was added in location C, facing to left. By June 1942 the personal insignia had been removed, leaving only the one bull in location C.
U 96	Two sawfish personal insignia in April 1941. Then one bull (in location C, facing to left) was added in spring/early summer 1941. By October 1941 the sawfishes had been removed, and there were two bulls in location B. Later there were two large bulls in location B. At the end of the boat's operational career there were again two normal sized bulls in location B.
U 213	One bull in location C, facing to left.
U 455	Location B in February 1942.
U 552	Location D.
U 553	Large bulls in location B.
U 567	Large bulls in location B.
U 575	Location B in August 1942. Large bulls in location B at another time.

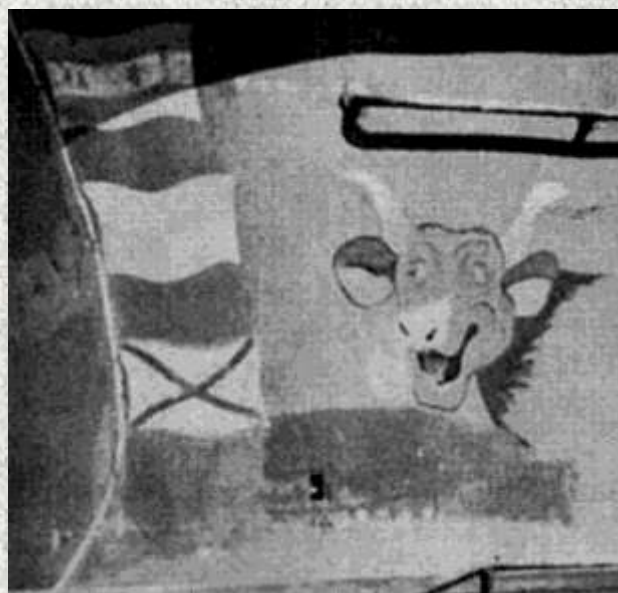
U 593	Location B, on black circle with white border.
U 617	Location B.
U 667	One bull in location C, facing to left, in October 1943.
U 707	Location B, just ahead of armoured box, in October 1943.

Part III - The Laughing Cow Of Lorient

When the crew of U 69, the fifth Type VIIC to be assigned to the 7th U-Flottille, received instructions to paint the snorting bull insignia on their boat's tower, no picture of the insignia was enclosed. The old hands who knew what the Bull Of Scapa Flow looked like were, by chance, on leave. Consequently, nobody serving aboard U 69 knew exactly what the snorting bull should look like. Nor was anybody willing to enquire about what the insignia of their own flotilla should look like, lest they appear foolish.

The attempts of U 69's First Watch Officer, Oberleutnant zur See Hans-Jürgen Auffermann, to design a bull drawing of his own were not successful. Instead he instructed a shipyard worker to copy the head of a laughing cow which appeared on the lid of a crate belonging to a popular French dairy product firm. The shipyard worker faithfully copied the laughing cow from the crate lid, together with the words that were present upon the French milk containers beneath it: "La Vache qui rit." The words became synonymous with U 69, as did the laughing cow insignia. U 69's new insignia was a source of great amusement. Instead of the aggressive symbol of the 7th U-Flottille - the raging, snorting "Bull Of Scapa Flow" - U 69 was adorned with its alter ego, the "Laughing Cow Of Lorient!"

The Laughing Cow was applied to U 69 in Lorient between the end of the boat's 2nd patrol on the 11th April 1941 and the beginning of the 3rd patrol to West Africa on the 5th May 1941.



Above (D15): The three flags to the left of the Laughing Cow belong to U 69's original "Horridoh" insignia. The "La Vache qui rit" markings that previously appeared below the cow have been painted over.

U 96 & The Laughing Sawfish

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- ⊕ Part II 9th U-Flottile Sawfish
- ⊕ Part III Das Boot
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- ⊕ Part V AMP Sawfish Decals

Part I - The Real U 96

A very popular insignia with U-boat modellers is the laughing sawfish. Also known as the laughing sawfish, this insignia was used on the famous U 96 as well as U-boats of the 9th U-Flottile. It also adorned the tower of the models used in the classic movie *Das Boot*.

The real U 96 was a very early Type VIIC U-boat. It was launched on the 1st August 1940 from the *Germaniawerft* shipyards in Kiel. A few weeks later, on the 14th September, it was commissioned into the *Kriegsmarine*. The boat lasted until March 1945, when it was destroyed during a bombing raid.

U 96 was the 11th highest scoring U-boat, sinking 28 ships of 190,094 GRT and damaging 4 ships of 33,043 GRT. All but four sinkings came under the command of Heinrich Lehmann-Willenbrock. He was the sixth highest scoring U-boat commander (or seventh depending on sources). U 96 would have another four commanders after Lehmann-Willenbrock but none would be anywhere as near as successful.

According to Georg Högel's *U-Boat Emblems Of World War II 1939-1945* (Schiffer Military History, 1999), the sawfish was first applied to U 96 by a friend of the commander called Kossatz. Högel also states that it was created after the end of the third patrol. This would be between the end of the third patrol (28/02/41) and the start of the fourth patrol (12/04/41).



Above (E1): A photo of Kossatz touching up the eyeball on U 96. Kossatz would have had no idea of how famous his design would become.



Left (E2): U 96 entering St. Nazaire at the end of the fourth patrol on the 22nd May 1941. Although it is impossible to determine colours from black and white photos, in this and other photos the upper colour of U 96 certainly looks too dark for the light grey *Hellgrau 50*. The medium grey *Dunkelgrau 51* would arguably be more advisable. The tricky question of the colour of the U 96 sawfish will be left until Part IV.



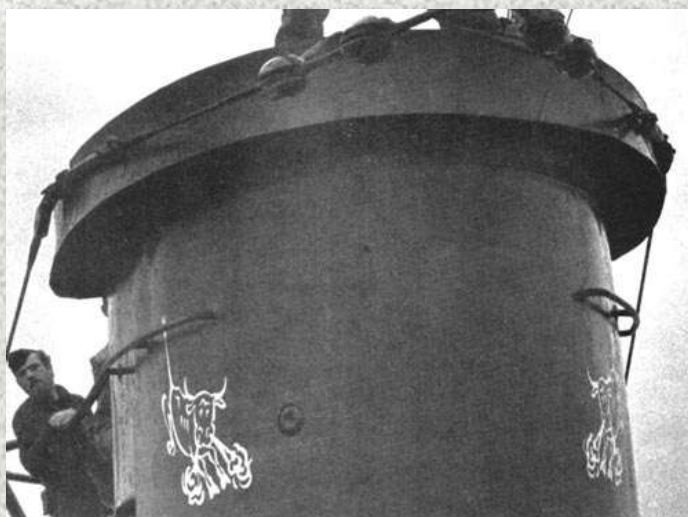
In the late spring of 1941, an order was issued to apply snorting bull insignias to all boats of the 7th U-Flottille boats. This was to honour Günther Prien, who had died aboard U 47 in March 1941. As U 96 was a member of the 7th U-Flottille, bulls would have to be applied to Lehmann-Willenbrock's boat.

U 96 had at this time a sawfish on either side of the tower. There being no space to apply two bulls, only one snorting bull was added.

Later in the year an order to remove the personal insignia from U-boats was issued. This resulted in the sawfishes (as the personal insignia of Heinrich Lehmann-Willenbrock) being removed from U 96. However, as the order did not prohibit flotilla insignia, U 96 retained the snorting bull. Now that more space was available, the one central bull was removed in favour of two bulls (one on either side).

Above (E3): In late spring and early summer 1941, U 96 had two sawfishes and one snorting bull. The bull was at the front of the tower, facing to the left. The bull was the flotilla insignia while the sawfishes were the personal insignia of the commander.

Right (E4): This photo of U 96 was taken by Lothar-Günther Buchheim during the boat's 7th patrol in late 1941. By this time the sawfishes had been removed, allowing space for two rather than one snorting bulls.



Later in U 96's career, the boat sported two very large bulls. The stencil used upon U 567 may have been used to apply this version upon U 96.

Right (E5): U 96 with two very large snorting bulls.

Below (E6): U 96 at the end of her operational career. Normal sized bulls can just be seen on either side of the tonnage figure.



Later still, at the end of U 96's operational career, the boat had medium-sized bulls once again. The boat also sported the tonnage figure of 247543, with BRT below. The true tally was 190,094 tons. The overestimation of 30% accords with the general overestimation of one third made by U-boat commanders.

For model-makers wishing to make U 96, the following details of the boat's modifications may be useful -

Combination on U 96				
Boat	Time	Netcutter	Breakwaters	Wind deflector
U 96	14/09/40 (com)	Y	Y	N
	12/04/41-22/05/41 (P4)	Y	N	Y
	27/10/41-06/12/41 (P7)	N	N	Y
"U 96"	In movie <i>Das Boot</i>	Y	Y	Y

Y=yes, N=no, P = patrol number, com = commissioning ceremony

Part II - 9th U-Flottille Sawfish

When Heinrich Lehmann-Willenbrock later assumed command of the 9th U-Flottille, his old sawfish personal insignia was appropriated as the flotilla insignia. As a result, many boats belonging to the 9th U-Flottille had sawfishes applied to their towers. This process of a personal insignia being later used as a flotilla insignia mirrors the same process that occurred with the snorting bull. The bull was originally the personal insignia of Prien and U 47, and was later appropriated as the insignia of the 7th U-Flottille.

Quite a few crews used sawfish badges on their caps. This was common practice for personal insignia, and on occasion flotilla insignia.

According to Georg Högel's book, the following boats had the 9th U-Flottille sawfish: U 90, 91, 211, 214, 217, 218, 230, 256, 309, 377, 407, 409, 443, 450, 456, 591, 595, 604, 606, 621, 659, 664, 739, 744, 755 and 954. Usually each boat would only carry the sawfish during its service with the 9th U-Flottille. But in the case of U 230 the sawfish was kept until the end.



Above left (E7): The sawfish on U 309. The background paint was a medium to dark grey. Again we see the sawfish colour is lighter than the background, and much lighter than the mouth. The eye is white with a black dot.

Above right (E8): The sawfish on the camouflaged U 407. The background paint on the boat may have been the light grey *Hellgrau 50*, with the dark grey *Dunkelgrau 53* on the right hand side. We can see that the sawfish is significantly lighter than the dark grey paint. We can also see that it is lighter than the red or dark red mouth, and the black eyeball. In both versions there are three saw teeth. In the U 96 version there were four saw teeth.

The colour guide in Högel's 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 sawfish was blue. However, there may have been variations in colour between these sawfishes. Blue, green and red have all been suggested as colours of the 9th U-Flottille. Some may indeed have been blue and others green. Red is much less likely but impossible to discount.

Part III - Das Boot

During U 96's seventh patrol (between 27/10/41 and 06/12/41) the war correspondent Lothar-Günther Buchheim was a guest on board. In the course of the patrol he took many photographs of the boat. Some of these photos are included in his book *U-Boat War*. However, it is another of his books – the novel *Das Boot* – which has become much more widely known. The novel is a classic of its type, authentically describing life aboard a wolf in the North Atlantic. One reason for the novel's feel of authenticity is that Buchheim based his work on his patrol aboard U 96. Indeed the commander in his book was largely based upon Heinrich Lehmann-Willenbrock.

The classic novel was then made into a movie of the same name. In the making of the movie, director Wolfgang Petersen continued with the detailed, authentic feel of the novel. The movie also became a classic, becoming very widely known around the world.

All of the models used in the movie had a black laughing sawfish. Everyone who watched the movie, whether on the small or large screen, saw the boat's insignia on the conning tower. Due to its appearance in the film it may now be the most well known of all U-boat insignia. It is now arguably more famous and more popular than the snorting bull.



Above (E9): The black sawfish on two of the movie's models. There were slight differences from the movie sawfish to the real U 96 sawfish.

The simplicity of the design, with the jagged teeth and bold smile, makes it one of the most aesthetic of U-boat insignia. For many modellers it is better looking than the snorting bull. There are more artistic insignia, such as U 94's British bulldog being tugged by a little animal. But the details of intricate insignia are lost in the scale used by most U-boat models. Even in 144th scale the details of the sawfish remain. One enthusiast liked the design so much he contemplated having it tattooed on his arm!

Given the movie's association with the sawfish, it comes as some surprise to find that the sawfish wasn't even present on the boat when Buchheim was on board. By the time he was on board during the famous seventh patrol, the sawfish had been replaced on the real boat with two snorting bulls. If the filmmakers had wished to be historically accurate, depicting U 96 as she really was during the latter stages of 1941, two bulls should have been used instead of two sawfishes. The filmmakers may have decided that the aesthetic qualities of the sawfish made it a better choice than the white outline of a snorting bull.

And then there is the question of the colour...

Part IV – The Perennial Sawfish Colour Debate

Two questions have vexed modellers and enthusiasts for decades: what was the colour of U 96's sawfish; and what was the colour of the 9th U-Flottille sawfishes? Countless debates have spilled over into arguments on this irresolvable subject. Green, blue, red and black have all been suggested. As we shall see, nobody really knows for sure what the U 96 sawfish colour was.

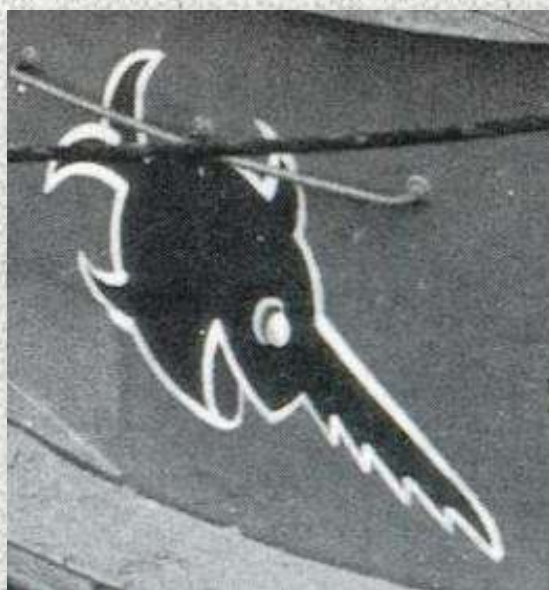
One confusing aspect is the assumption by some that the U 96 and 9th U-Flottille insignia were the same colour. But the colour (or colours) of the 9th U-Flottille sawfishes are consistently lighter than the sawfish on U 96. The 9th U-Flottille sawfish were therefore lighter in shade than the U 96 version. They may have been a different colour entirely.

Revell chose to make their U 96 sawfish decal for their 144th scale VIIC kit blue. They may have chosen the blue colour for their U 96 due to the report in Georg Högel's of a 9th U-Flottille sawfish being blue. However, due to the significant difference in shade, the 9th U-Flottille sawfish was not necessarily the same colour as the U 96 sawfish.

The makers of *Das Boot* opted for black. They may have chosen this option after seeing the sawfish looking so dark in the U 96 photos. We should be aware that Heinrich Lehmann-Willenbrock was himself involved in some capacity with the movie. He was pictured with Jürgen Prochnow, the actor who played the commander in the film. Was Lehmann-Willenbrock asked at the time about the true colour? Could he have told the movie makers it had been black? Or did he tell them he couldn't remember the colour due to the passage of time? Or was he even asked about his insignia?

Questions, questions and more questions. But as with all matters regarding sawfish colours, no definitive answers are forthcoming.

Right (E10): A close up of the sawfish on the starboard side. In this view we can see the mouth was a different colour, very likely red. We can also see the eyeball. The sawfish does look very dark against the medium grey background. If the sawfish was not black then it was certainly very dark. Note the four saw teeth.



One interesting aspect relates to the metal sawfish pennant that was attached to the top of the commander's flagstaff on U 96. The metal pennant is still in existence, having belonged to Heinrich Lehmann-Willenbrock until his death in 1982.

This metal pennant is very roughly a lime green colour. As it would not make sense for the painted insignia and the metal pennant to have been different colours, could the sawfish painted on U 96's tower also have been a lime green colour? Of course the piece could very easily have been painted a different colour over the years. There may not have been a desire to keep the authentic colour, or the correct paint might not have been available. As a result I offer this information as a matter of interest rather than proof.

It has been suggested that the lime green colour in the photo above is too light for the shade evidenced in period photos of U 96. However, one only has to remove the colour from this photo to prove this to be inaccurate.



Right (E11): The metal sawfish pennant in a wartime shot.



Above left (E12): This is the actual metal pennant used on U 96. Note the colour of the paints used.

Above right (E12b&w): The same photo of the metal pennant, with the colour removed. No other adjustments have been made. The lighter parts are where light is directly striking the object. The darker parts, at the top and the left, are so dark they may be mistaken for black.

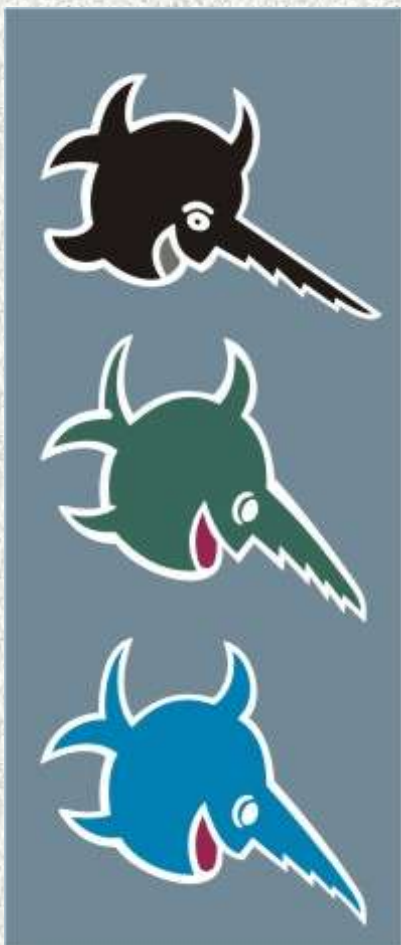
This debate still leaves the modeller no wiser. It is all very interesting, I hear you ask, but what colour do I make my sawfish on my model?

Given the faint scraps of information at our disposal, I would suggest either a very dark green or black for the U 96 sawfish. As for the 9th U-Flottille sawfish, I would opt for either a medium green or a medium blue.

I fear we shall attain a definitive resolution on this question. So we must be very careful not to criticise others too much when they opt for a colour that is different to our preference.

Part V – AMP Sawfish Decals

The sawfish is available to modellers through the range of decals by Accurate Model Parts. Rather than one sawfish design, three separate distinct designs were created during the research stages.



Das Boot movie version – Designed from video captures from the movie *Das Boot*. This is characterised by the following: black colour, grey mouth, narrow saw, eye with black dot, eyebrow directly over eye.

U 96 version - Designed from photos of U 96 returning to St. Nazaire on 22nd May 1941 (see photo E2). This is characterized by the following: dark lime green colour, red mouth, four saw teeth, white lines from fins extend into green area.

9th U-Flottille version – As this version differed between boats, it is a compromise between several sawfish designs. The main characteristics are the blue colour and three saw teeth.

Each decal sheet includes all three designs in both starboard and port sides. They are available in 35th scale (SAW-35), 72nd scale (SAW-72), 144th scale (SAW-144) and 350th scale (SAW-350).

Left (E13): The AMP sawfish decal designs illustrate several key differences between designs. One difference is that the U 96 design had four teeth, while most 9th U-Flottille designs had three saw teeth.

German U-Boat Victory Pennants

Contents

- ⊕ Part I Merchant Ship Victory Pennants
- ⊕ Part II Warship & Aircraft Victory Pennants
- ⊕ Part III Tonnage Figures
- ⊕ Part IV Commissioning Pennant
- ⊕ Part V AMP Flag Range

Part I - Merchant Ship Victory Pennants

The practice of displaying victory pennant flags (*erfolgswimpeln*) when German U-boats entered port after a patrol was commonplace. Crewmen would often paint the tonnage of a vessel they had sunk during that patrol upon a white pennant flag. Each pennant would denote a ship sunk, and they would be hung in a line from the attack periscope to the tower below. White pennants signified a merchant ship had been sunk, while a red pennant indicated the sinking of a warship.

This practice originated from the First World War. After a particularly successful five week patrol, 23 pennants were hung from Lothar Von Arnould De La Periere's U 35.

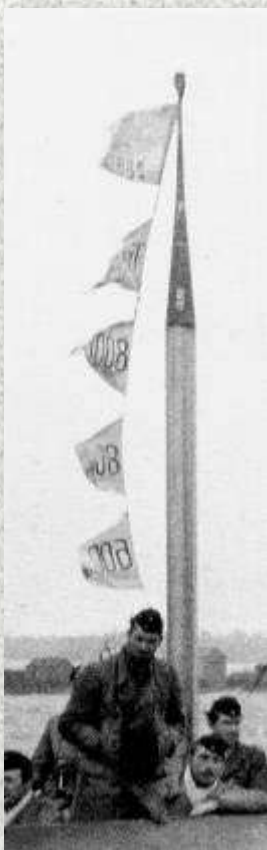
Now and again - when only a couple of victory pennants were to be displayed - the pennants were flown from the commander's flagstaff.



Above (F1): An example of victory pennants flying from the attack periscope of U 123. U 123 was a particularly successful boat, sinking no fewer than 47 vessels. The Type IXC sank many of these ships while operating off the US coast in early 1942.

Left (F2): Four pennants flying from the top of the attack periscope of U 588. The attack periscope was the rearmost of the two periscopes. The pennant is representative of the most common type of design: a tonnage value rounded up to the nearest thousand.

German U-Boat Victory Pennants



Left (F3): Five pennants flying from the attack periscope of U 124. We are looking at the pennants from the reverse side. As a result we see the mirror image of the tonnage values figures (again rounded up to the nearest thousand).

Right (F4): Wolfgang Lüth, the second most successful commander (47 ships for 225,756 tons), aboard U 181. In contrast to the image of U 124 above, the reverse side of these pennants does not show the mirror image of tonnage figure. These flags were sufficiently thick to allow the figures to be painted on both sides of the flag. However, it was more common to see thinner flags with figures painted on one side only.



As the victory pennants were prepared by hand on the return home from a patrol, there were some slight variances in the values painted onto the flags. Usually this would consist of the tonnage value rounded up (or sometimes even down) to the nearest thousand.

The following are some of the typical practices utilised during the preparation of the flags –

- when the exact vessel had been identified the exact tonnage figure was sometimes applied to the flag
- some commanders chose to apply the name of the vessel to the flag rather than a tonnage value
- the insignia of the U-boat would sometimes feature (such as U 99 and U 564)
- some flags had a black border around the edge of the flag
- a few flags had a red border around the edge of the flag
- now and again the pennant flags would be marked with simply *Frachter* (freighter) or *Tanker*
- some flags had the silhouette of the vessel sunk
- a small number had the silhouette of the vessel sunk and the tonnage value
- a small number were painted with the image of a ship sinking

Right (F5): The insignia of U 564 was the black cat with “3X” below. U 564’s commander Reinhard Suhren appropriated this insignia from U 48, the boat he previously served on as First Watch Officer. The pennants included U 564’s insignia as well as an indication of whether each vessel was a *Frachter* (freighter) or a *Tanker*. Note also that the flags included a border around the edge.



German U-Boat Victory Pennants



Left (F6): The victory pennants on U 99 consisted only of a horseshoe. Rather than a painted insignia, U 99 actually had horseshoes welded onto both sides of the tower.

Right (F7): On rare occasions the pennant flags would be marked with simply *Frachter* (freighter) or a *Tanker*. These also have a border around the edge.



Although crews

proudly displayed the tonnage values they had sunk, it must always be remembered that each pennant represented the

sinking of a ship. This often resulted in the bravest of sailors dying in the most brutal of circumstances. The showmanship involved in victory pennants does not respect the awful consequences that the crew had unleashed during the patrol.

Below (F8): Ten pennants hanging from the attack periscope to the tower railings on U 47 on the 6th July 1940. Each pennant included a depiction of the merchant ship sunk. Some show the silhouette, while on others the ship is actually shown in the process of sinking.



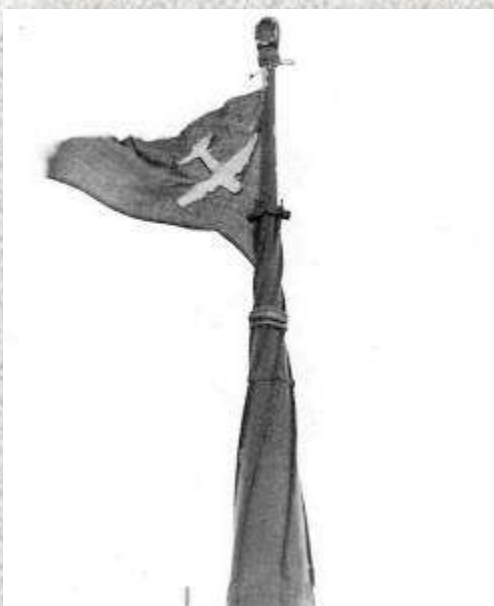
Left (F9): A tragic image. The 15501 figure is attributed to the sinking of the 15,501 ton passenger cargo liner *Arandora Star*. The crew of U 47 were unaware of the high number of men on board. Nor did they realise they had sent many of their own compatriots down to a watery grave. A total of 805 lives were lost in this tragedy: 243 Germans, 470 Italians, 55 crew and 37 military guard.

Part II - Warship & Aircraft Victory Pennants

While a white flag indicated the sinking of a merchant ship, a red flag was used to indicate the sinking of a warship. As the sinking of escorts was much rarer than merchant ships, it follows that the red flags were much less common than white merchant flags. Usually the white silhouette of the warship would be depicted upon the red flag.

On rare occasions when red flags were not available, a white flag would be used for the warship flag. Sometimes a small White Ensign would be added to the corner if a British warship had been sunk.

On a similar theme, the shooting down of an aircraft was celebrated using a red flag. Instead of the silhouette of a warship, these flags would be adorned with the top view of an aircraft. These aircraft pennants were very rare in the early years. From the mid-war period, the threat posed from the air greatly increased. To battle against Allied planes, U-boats were fitted with much heavier anti-aircraft guns. In the end the U-boats became overwhelmed by aircraft, being sunk in very large numbers. However, on occasions U-boats did manage to shoot down the Sunderland, Hudson, Catalina or other aircraft that was attacking.



Above right (F10): This image shows the silhouette of two destroyers that the crew of U 968 believed they had sunk. The story of U 968's encounters with Allied destroyers can be found in the excellent *U-Boat Im Focus* Edition 1.

Left (F11): The aircraft pennant fluttering from the attack periscope celebrates the downing of a British Sunderland. On some occasions the aircraft pennant was white rather than red.

Part III - Tonnage Figures

Usually the number of flags indicated how many ships had been sunk during the patrol. But it was reasonably common on the most successful boats to sport a flag for each ship sunk during the boat's career to date. U-boats such as U 48, U 123, U 181 and U 552 did amass an unfortunately high tally of ships sunk. On occasions the towers of these boats were decorated with dozens of flags, too many in fact to fit on a line from the attack periscope. In these cases the jumping wires were used as makeshift lines on which to hang the pennants.

When it was possible to identify the ship, the exact tonnage was sometimes added to the pennant. Or, to match the rest of the pennants, the exact tonnage was often rounded up to the nearest thousand or half thousand. But we cannot take for granted that the tonnage values we see on the flags were accurate, nor that the number of flags was the true number of vessels sunk. The pennant flags indicate the number of ships the U-boat crew *thought* they had sunk during the patrol. The difference between what the crew thought they had sunk and what they actually *did* sink is often marked.

Sometimes the commander and crew would not see the consequences of their torpedo hit. Many would make a fallacious presumption that they had sunk a vessel, when in fact they had only wounded their prey. If they were operating against a convoy, on occasion the torpedo would hit a different ship from the one that had been aimed at. The commander and crew may not realise that another vessel was hit, thinking instead that they had successfully struck their intended target. In such a scenario the commander would add his estimation of the ship he had aimed at rather than the one he had actually hit.

Often the commander would have had no choice but to make a rough estimation of the tonnage of the ship attacked. The commander may have been hampered by the poor meteorological conditions that can often prevail in the rolling seas of the North Atlantic.

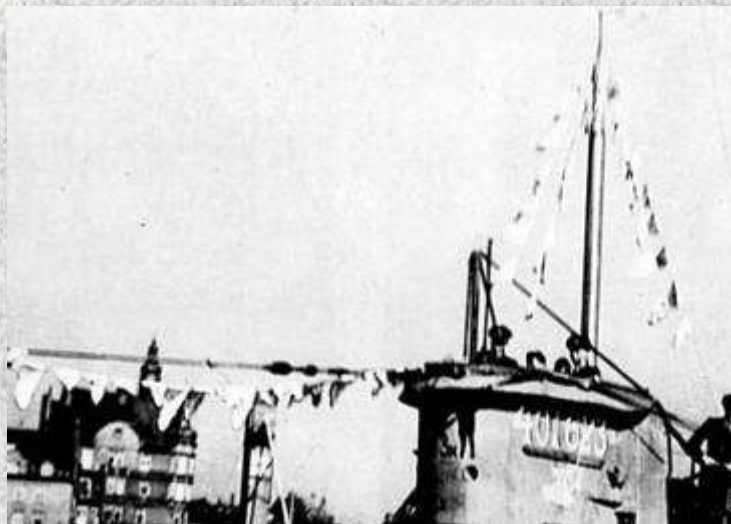
Furthermore, he may only have been afforded a snapshot through his attack periscope. Such circumstances would preclude accurate estimation of the intended target. Often attacks were made at night, when the black cloak of darkness would help camouflage the attacking U-boat. But the darkness would also hinder the estimation of target size and type.

We can see, therefore, that the conditions under which commanders were operating would result in errors in tonnage estimation. Human nature being what it is, these estimations were usually made on the higher side rather than lower. The overestimating of tonnage values was very common indeed, with U-boat commanders generally overestimating by around a third. This is consistent with submarine commanders from other nations, who were also prone to the same degree of over-claiming.

Let us take an example of the estimations made by the commander of U 47, Günther Prien, during the boat's sixth patrol. Prien was rather competitive with respect to tonnage sunk. In one war diary entry Prien actually pours scorn on Schepke's tonnage claims!

During patrol 6, the commander estimated that they had sunk 10 ships of 66,587 tons. The actual tonnage sunk was 8 ships of 51,189 tons. This equates to an overestimation of exactly 30%.

In the table below, the fourth column shows the ships Prien thought they had sunk, while the fifth column shows the tonnage he estimated these vessels to have been. These are the ship names and tonnage values as recorded by Prien in the boat's KTB (war diary) and shooting reports. The sixth column shows the tonnages on the ten pennant flags.



Above (F12): The most successful Kriegsmarine U-boat - the Type VIIB U 48 - at the end of an illustrious operational career in June 1941. The pennants all denote the ships the crew thought they had sunk during the boat's career. The tonnage figure of 401623 tons that is painted in white on the tower is the figure estimated by the crew to have been sunk by the boat. The actual figure now credited to U 48 is 51 ships for 306875 tons. This discrepancy of 30.8% is an ideal indicator of tonnage overestimation.

Estimated versus actual tonnage sunk by U 47 during patrol 6					
Date	Name of real ship	Real tonnage	Name of estimated ship	Estimated tonnage	Tonnage on flags
14/06/40	<i>Balmoral Wood</i>	5,834	<i>Balmoral Wood</i>	5,834	5,800
21/06/40	<i>San Fernando</i>	13,056	<i>Cadillac</i>	12,100	12,100
21/06/40	(unknown, missed)	0 (missed)	unidentified freighter	7,000	7,000
21/06/40	(unknown, missed)	0 (missed)	<i>Gracia</i>	5,600	5,640
24/06/40	<i>Cathrine</i>	1,885	<i>Kadri</i>	2,775	2,775
27/06/40	<i>Lenda</i>	4,005	<i>Lenda</i>	4,005	4,000
27/06/40	<i>Leticia</i>	2,580	<i>Letitia</i>	2,800	2,580
29/06/40	<i>Empire Toucan</i>	4,127	<i>Empire Toucan</i>	7,000	7,000
30/06/40	<i>Georgios Kyriakides</i>	4,201	<i>Georgios Kyriakides</i>	4,201	4,201
02/07/40	<i>Arandora Star</i>	15,501	<i>Arandora Star</i>	15,501	15,501
Totals	-	51,189	-	66,816	66,597

The differences between the war diary figures and the figures painted on the tonnage flags are due to a re-examination of the ship registers between the time when the war diary entries were written and the flags made. This is evidenced by the fact that Prien reported on the 1st July that they had sunk 9 ships for 51,086 tons. The 15,501 tons for the *Arandora Star*, which was sunk the following day, would take the tally to the 66,587 tons painted on the tower. However, the tonnage figures on the flags total 66,597 rather than 66,587! Presumably the crew made a mistake when making the pennant flags.

The overestimation by Prien in the example above illustrates exactly how the tonnage figures on the pennants could be different to the real tonnage sunk. We can also see evidence of mistakes made by the crew in relation to the values added to the flags. In the case of the *Balmoral Wood* and the *Lenda* we can also see evidence of a slight rounding down.

Part IV - Commissioning Pennant

Even more common than the victory pennants was the commissioning pennant, which was also known as the command pennant or commander's pennant. This was a narrow strip of white material flown from the commander's flagstaff when the boat was in port. The commander's flagstaff was attached to the rear of the inside of the tower bulwark. On Type VIICs that had the horizontal air intake grill at the very top of the air trunks, there would usually be a hole in the grill for the flagstaff to be mounted.



Above (F13): U 132 arrived at La Pallice at the end of the 4th patrol on 16th August 1942. Members of the crew are preparing five victory pennant flags to be displayed on the boat's tower on that date. The boat sank five ships during the patrol; these ships were 2555, 3382, 4312, 4367 and 6734 tons. The figures on the pennants are 4000, 4500, 7000, 8000 and another of indeterminate value. This shows an overestimation of tonnage values, and of rounding up to the nearest thousand.



Left (F14): The commissioning pennant is flying from the commander's flagstaff.

Right (F15): This photo shows how the commissioning pennant was attached to the top of the commander's flagstaff on U 96. We can also see how the material splits into two at the bottom of the pennant. As there was only one white merchant victory pennant, it has been attached to this flagstaff rather than the attack periscope.



Part V - AMP Flag Range

Commissioning pennants and a full range of tonnage flags are available from AMP in our “Germany 1939-1945 U-Boot Pennant sheet” (code DK-UBPEN-072). The fabric flags depict the most common design of pennant - the white flag with the tonnage figure rounded to the nearest thousand. The following values are included in the fabric sheet –

500, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, 6000, 7000, 8000, 9000, 10000, 11000, 12000, 13000 and 15000

Also included in the sheet are –

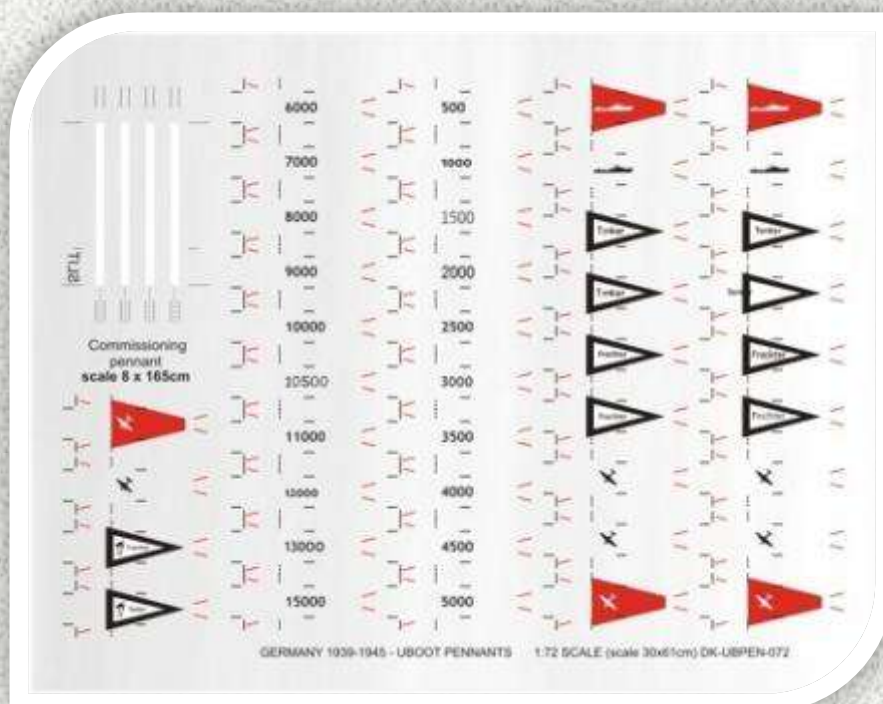
- Frachter (lower case lettering, with border) X4
- Tanker (lower case lettering, with border) X4
- - U 564's Frachter X1
- U 564's Tanker X1
- warship pennant (red flag with destroyer silhouette in white) X2
- warship pennant (white flag with destroyer silhouette in black) X2
- twin-engined aircraft pennant (red flag) X1
- four-engined aircraft pennant (red flag) X2
- twin-engined aircraft pennant (white flag) X1
- four-engined aircraft pennant (white flag) X4
- commissioning pennant X4

Exact figures can be custom designed to order.

German U-Boat Victory Pennants

As we know, the real number of sinkings and the true tonnage values were often not applied to the flags. This does present difficulties for modellers striving for authenticity. The best method is to find period photos showing the chosen boat with tonnage pennants. However, such shots are usually unavailable to most modellers. The next best method is to look up the boat's patrol history. The patrol history and sinkings of all Kriegsmarine U-boats can be found at <http://ubootwaffe.net/>

Even though we know the true number of sinkings and the true tonnage values, we will still have to make educated guesses as to how many flags were flown and the values painted upon them. If three ships were actually sunk and two damaged, it may be that the crew thought they had sunk all five. They may even have thought they had sunk an extra vessel or two. In this case, having six flags flying from the attack periscope would be perfectly reasonable. As for the values, it may be prudent to round up the real values. For a ship of 3,456 tons, one could use a pennant flag of 4,000 or even 5,000 tons.



Above (F16): The “Germany 1939-1945 U-Boot Pennant sheet” (code DK-UBPEN-072) from Accurate Model Parts (AMP).

U-Boat Model Kits & Accessories

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Part I – Introduction

Before the release of Revell's 1/72nd Type VIIC U-boat in late 2003, the modelling community was poorly served with respect to accurate U-boat models. There were no affordable plastic kits of reasonable scale that accurately depicted a Kriegsmarine U-boat. Although a plethora of kits and accessories were available for aviation, armour and other naval subjects, the U-boat was sorely neglected. Given the aesthetics, history and importance of the Type VII - and to a lesser extent the Type IX and Type II – the release of a quality kit was long overdue.

Compared to the final month of 1999, the quality and number of kits presently at our disposal has greatly increased. This mini-article reflects upon the expansion in our choice of U-boat kits, and our resultant improvement in knowledge, during the past decade. In the latter stages of this article, a list of the most popular/useful kits and accessories is presented in tabular format.

The bad old days

The kits that were available in December 1999 were not of the quality we expect today. We could choose Nichimo's 1/200th scale Type IXB and IXC, or Academy's 1/150th scale IX. All three are designed to be motorised, and are arguably not worthy of the talents of serious modellers. On the Type VII front we did have a pair of 1/125th scale VIIB U-boats from the Revell stable: a U 47 version with early VIIB tower and interior; and a U 99 version with late VIIB tower. Both kits appear toy-like in comparison to the current crop of Revell U-boats. Revell also offered a 1/144th scale Type XXI. But the kit is notoriously inaccurate, incorporating details from the *Wilhelm Bauer* (a post-war modified Type XXI). A cutaway version of this XXI kit, with interior, was also available.

One popular radio-controlled model could be found in the shape of Robbe's 1/40th scale Type VIIB. This semi-scale kit is an ideal starter kit for radio-controlled submarine modellers, and fulfils this remit successfully. It bears a passing resemblance to its intended subject – the VIIB U 47 – but is inaccurate in almost every respect to the real boat. This effectively precludes the building of an accurate replica.

A very decent kit was available to us ten years ago. This came in the form of Accurate Armour's 1/35th scale resin waterline Type VIIC. The under-rated kit allows the modeller to depict a VIIC at sea or moored in port. There are three heavy slabs of resin for the hull sections, and a very decent resin tower. The 88mm deck gun and 20mm Flak gun are both of a high standard, as are the many white metal and resin details. Due to sheer volume of resin in the kit and the multitude of parts, the price of the kit far surpasses the budget of many modellers. And, of course, it is not a full hull model but a waterline version.

Last, but certainly not least, we have the infamous Amati U 47. This 1/72nd scale mixed media kit is remembered with mixed emotions by every modeller who has attempted to build one. The one piece hull is resin, while wooden frames are added under the brass deck. The main group of free flooding holes comes via four long pieces of brass; these ensure that the holes are depicted very neatly. The same could not be said for the rest of the free-flooding holes, which all have to be drilled by the modeller. As some modellers found to their cost, the Amati kit is a very different prospect to an out-of-box moulded plastic build. A good deal of time, patience and effort is required to complete the model. Although challenging, the building of the Amati kit is also very rewarding. In particular the one piece resin hull is an absolute pleasure to work with.

Yet there is one factor which tarnishes the Amati build. The finished article can be a stunning attraction on a mantelpiece, but it is not an accurate depiction of the real U 47. Over one hundred differences between the model and the real boat can be determined. A massive amount of research, a fair slice of scratchbuilding, and a high degree of skill and experience on the part of the modeller are necessary to render even a semi-accurate appearance. The multiple inaccuracies can be a source of endless annoyance for a modeller who has already expended the time, effort and cost in building this model.

When the release of Revell's U-boat kit was announced in 2003, many enthusiasts were thrilled. A 1/72nd scale Type VIIC...in injection moulded plastic! It may be hard to appreciate now, when we have this kit and a wealth of aftermarket goodies in our glue-covered hands. But at the turn of the century we only had the aforementioned Amati 1/72nd "U 47", two poor renditions of the VIIB in 1/125th scale, a poor version of the XXI, and a semi-scale U 47 in 1/40th scale from Robbe. We did not, therefore, have *any* accurate affordable plastic U-boat model kit that was big enough for super-detailing purposes.

The Revell Type VIIC kit had, at long last, provided us with an affordable and reasonably accurate VII model.

From dearth to wealth

As a new decade begins, we have a range of quality U-boat kits to choose from. Revell followed up on the success of their original kit by producing a late war VIIC/41 version. Within the coming year, a VIIC, VIIC/41 and VIID will all be available in 1/144th scale. These 1/144th scale Revell kits are scaled down versions of their original VIIC, with identical design attributes.

Perhaps in recognition of the interest stimulated by the Revell kits, other model companies have also turned their attentions to the subject. One highlight is Special Navy's excellent 1/72nd scale Type IIA. The plastic/resin/white metal kit can be built into a very accurate model with the assistance of a certain aftermarket set. Special Navy will also release a 1/72nd scale *Vesikko* (the prototype for the Type II class) in due course. Rumours of Type IIB version may or may not prove to be fallacious. CMK Maritime Line is reported to be releasing a 1/72nd scale waterline VIIC in resin, which should prove very interesting indeed. This company also offer a whole range of products to allow a dry-dock diorama scene to be built. Dream Arts produce several towers (a VIIB, two VIICs, a Mittelmeerturm and a Turm IV), all of which can be fitted to Accurate Armour's 1/35th scale waterline VIIC. The high quality of the Accurate Armour and Dream Arts products is well recommended.

For modellers with sufficient financial resources, and indeed shelf space, there are three high quality radio controlled boats available in large scales. The 1/32nd OTW VIIC is the most modestly priced option. Having had the opportunity to study this kit, I can attest that it would build up to a very fine model indeed. I have not had the pleasure of studying the 1/32nd scale Andrea Miniatures VIIC or the 1/34th scale Engel VIIC. But the photos of these very expensive kits do show that one can produce very fine replicas from these kits. Naturally their high price excludes them from the shopping list of all but the most affluent of modellers.

In smaller scales, we have many new kits coming to the market. AFV Club and Flagman are both in the process of bringing a range of 1/350th scale U-boat kits to the market. These kits appear to be at least as good as the 1/400th scale Mirage Hobby range of kits. Revell have also brought a 1/350th VIIC, which is another scaled down version of their larger boats.

We are waiting!

While the demand for VIICs and IIAs has been mainly satisfied, a few variants and types are not yet available. Given the success of VIIBs such as U 47, U 48, U 99 and U 100, and the popularity of their commanders, a VIIB conversion set for the Revell kits would be warmly received. Given the camouflage schemes employed on the Mediterranean boats, a 1/72nd scale VIIC *Mittelmeerturm* (Mediterranean tower) would also prove to be very popular.

No company, as yet, has offered us an original VII (also known as the VIIA). Finished in Spanish Civil War colours, an original Type VII would be a welcome addition to our current choices.

The most obvious omission from the list of available kits is, of course, a 1/72nd Type IX. The demand for a quality injection moulded Type IX kit is certainly there. The U 505, having been largely unmodified since her capture in 1944, is an ideal prototype upon which to base an accurate Type IX model. The boat is currently lying in Chicago awaiting the arrival of a representative from a certain injection-moulded model company.

Come on Revell, we are waiting!

Notes for tables

- The tables do not form a fully comprehensive list of all U-boat models available past and present. Rather they list the most popular and useful kits/accessories as of December 2009.
- The prices in the tables are provided to give a rough indication of value. Most of the prices are current for December 2009 but modellers may be able to buy kits for a more reasonable price.
- Prices are in US Dollars (\$), UK Pounds (£) or Euros (€); the figures do not include shipping.
- Unless otherwise stated, Euro and £ costs include European tax.
- Some kits/accessories are out of production but have been included if they are of sufficient interest.
- Some kits/accessories have yet to be released.
- Some modellers choose to build their U-boat as part of a diorama, so accessories pertaining to a dry-dock or dockside diorama are included in the tables.
- Injected moulded plastic kits are presumed to have decals included as standard.

Materials of construction	
Code	Material
B	Brass
D	Decals
F	Flags (paper)
FF	Fabric flags
GRP	Glass reinforced plastic (fibreglass)
M	Metal
P	Injected moulded plastic / plastic
PE	Photo-etched brass
R	Resin
SR	Ready-made soldered railings
SS	Stainless steel
V	Vacuform
W	Wood
WM	White Metal

Above: The codes above have been used in the tables to follow.

- The codes attributed to the kits and accessories may vary between sellers.
- Since I have not had the opportunity to examine each kit, it was necessary to rely upon the information listed in various websites. As a consequence, the details (particularly the materials of construction) cannot be guaranteed. If Engel or Andrea Miniatures would care to send me their lovely kits, I would be very happy to guarantee their materials of construction.

Part II – 1/32nd to 1/60th scale

Manufacturer	Code	Subject	Scale	Materials	Price
Full hull kits					
32nd Parallel	01-000	VII	32	GRP	\$525.00, out of production
Andrea Miniatures	LP-02	VIIC	32	GRP,R,PE,WM,D,F	€1784.48+VAT
Andrea Miniatures	LP-02	VIIC - painted	32	GRP,R,PE,WM,D,F	€7882.50+VAT
Engel	1591-FC16	VIIC + diving system + controller	34	GRP,R,PE,WM,SR,B.SS	€2999.00
Engel	1591-TMX	VIIC + diving system	34	GRP,R,PE,WM,SR,B.SS	€2095.00
Engel	1591-DIS	VIIC display	34	GRP,R,PE,WM,SR,B.SS	€1346.00
Italeri	5609	Biber	35	P	Future
Krick	20310	VIIB semi-scale	60	GRP	€179.00
Krick	-	IA U 25 semi-scale	-	GRP	-
OTW Designs	Type 7	VIIC (tower in PE)	32	GRP,R,PE,WM	£750.00
Precision Pattern	-	XXI	48	GRP,R,PE,M	\$499.00
Robbe	1-1114	VIIB U 47 semi-scale	40	GRP	€375.00
Robbe	1-1214	XXI U2540 semi-scale	40	GRP	€599.00
Verlinden	810	Biber	35	R,B	\$59.95
Verlinden	816	Neger	35	R,B	\$32.95
Verlinden	947	Seehund	35	R,B	\$94.95
Verlinden	1015	Hecht	35	R,B	\$89.95
Waterline kits					
Accurate Armour	S01	VIIC waterline	35	R,PE,WM	£327.88
Accurate Armour	S02	XXIII waterline	35	R,PE,WM,D	£161.49
Towers					
Accurate Armour	S04	VIIC conning tower	35	R,PE,WM	£88.08
OTW Designs	Type 7	VIIC tower in GRP	32	GRP	£60.00
Dream Arts	-	VIIB tower	35/40	R,PE,M	-
Dream Arts	1001	VIIC U 552 tower	35/40	R,PE,M	€81.00
Dream Arts	1002	VIIC U 201 tower	35/40	R,PE,M	€81.00
Dream Arts	1003	VIIC Mittelmeerturm	35/40	R,PE,M	€86.00
Dream Arts	1004	VIIC Turm IV tower	35/40	R,PE,M	€91.30
Accessories					
Accurate Armour	S05	VIIC 88mm deck gun	35	R,PE,WM	£24.47
Accurate Armour	S06	VIIC 20mm gun	35	R,PE	£9.79
Accurate Armour	S07	VIIC decals & flags	35	D,F	£11.74
Accurate Armour	S08	XXIII decals & flags	35	D,F	£4.65
Accurate Model Parts	DK-UBPEN-035	Kriegsmarine U-boat pennant set	35	FF	On request
Accurate Model Parts	SAW-35	Sawfish decals	35	D	TBA
Accurate Model Parts	G-35N	VII snorting bull normal	32-40	D	\$7.95
Accurate Model Parts	H-35L	VII snorting bull large	32-40	D	\$7.95
Accurate Model Parts	DK-KMNE-80X135-032	Kriegsmarine flag 80X135cm	32	FF	\$6.95
Accurate Model Parts	DK-KMIC-80X135-032	Kriegsmarine Iron Cross Substitute 80X135cm	32	FF	\$6.95
Accurate Model Parts	DK-KMNE-100X170-032	Kriegsmarine flag 100X170cm	32	FF	\$7.95

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Accurate Model Parts	DK-KMIC-100X170-032	Kriegsmarine Iron Cross Substitute 100X170cm	32	FF	\$7.95
Accurate Model Parts	DK-RMNE-80X135-032	Reichsmarine flag 80X135cm	32	FF	\$6.95
Accurate Model Parts	DK-KMNE-80X135-035	Kriegsmarine flag 80X135cm	35	FF	\$6.95
Accurate Model Parts	DK-KMIC-80X135-035	Kriegsmarine Iron Cross Substitute 80X135cm	35	FF	\$6.95
Accurate Model Parts	DK-KMNE-100X170-035	Kriegsmarine flag 100X170cm	35	FF	\$7.95
Accurate Model Parts	DK-KMIC-100X170-035	Kriegsmarine Iron Cross Substitute 100X170cm	35	FF	\$7.95
Accurate Model Parts	DK-RMNE-80X135-035	Reichsmarine flag 80X135cm	35	FF	\$6.95
Accurate Model Parts	DK-KMNE-80X135-048	Kriegsmarine flag 80X135cm	48	FF	\$6.95
Accurate Model Parts	DK-KMIC-80X135-048	Kriegsmarine Iron Cross Substitute 80X135cm	48	FF	\$6.95
Accurate Model Parts	DK-KMNE-100X170-048	Kriegsmarine flag 100X170cm	48	FF	\$6.95
Accurate Model Parts	DK-KMIC-100X170-048	Kriegsmarine Iron Cross Substitute 100X170cm	48	FF	\$6.95
Accurate Model Parts	DK-RMNE-80X135-048	Reichsmarine flag 80X135cm	48	FF	\$6.95
Andrea Miniatures	LP-10	VIIC section	32	R,M	€1056.00+VAT
Andrea Miniatures	LP-10	VIIC section - painted	32	R,M	€3240.00+VAT
Andrea Miniatures	S5-S09	VIIC mid-deck & tower	32	R,PE,WM,D,F	€309.99+VAT
Andrea Miniatures	S5-S09	VIIC mid-deck & tower - painted	32	R,PE,WM,D,F	€1921.41+VAT
Andrea Miniatures	S5-S10	VIIC deck gun & crew	32	R,WM	€111.12+VAT
Andrea Miniatures	S5-S10	VIIC deck gun & crew - painted	32	R,WM	€346.29+VAT
Dream Arts	1110	VIIC deck – for Robbe	40	P,R	€81.00
Dream Arts	1111	VIIC vent slots – for Robbe	40	P	€35.90
Dream Arts	1112	VIIC mid-war deck – for Robbe	40	P	€81.00
Dream Arts	1113	VIIC late-war deck – for Robbe	40	P	€81.00
Dream Arts	1114	VIIC late-war vent slots – for Robbe	40	P	€35.90
Dream Arts	1115	VIIC mid-deck section -for Robbe	40	R,WM	€79.00
Dream Arts	1303	VIIB decals	40	D	€8.50
Dream Arts	1304	VIIC decals	40	D	€9.50
Dream Arts	1305	VII Mittelmeer decals	40	D	€6.50
Dream Arts	1306	VIIC/41 decals	40	D	€9.00
Dream Arts	1401	20mm barrel	40	M	€5.65
Dream Arts	1402	20mm 38 barrel for XXI	35	M	€7.17
Modelbrass	-	XXI deck – for Robbe	40	PE	-
Modelbrass	-	VIIB deck – for Robbe	40	PE	-
Modelbrass	-	VIIC conversion (deck & tower) – for Robbe	40	PE	-
OTW Designs	-	Conning tower kit	32	GRP,R,PE,WM	£165.00
OTW Designs	-	Turm IV kit	32	GRP,R,PE,WM	-
Robbe via Dream Arts	1102	Torpedoes	40	P	€14.10
Robbe via Dream Arts	1405	3.7mm Flak gun	40	P,B	€13.85
Robbe via Dream Arts	1406	88mm deck gun	40	P	€11.80

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Robbe via Dream Arts	1407	20mm Flak gun	40	P	€8.70
Robbe via Dream Arts	1408	20mm Flak gun	40	P,B	€9.20
Robbe via Dream Arts	1409	20mm Zwilling Flak gun	40	P,B	€14.85
Figures					
Accurate Armour	F34	Commander	35	R	£8.31
Accurate Armour	F35	Deck officer	35	R	£8.31
Accurate Armour	F36	Officer mixed dress	35	R	£8.31
Andrea Miniatures	S5-B14	Commander bust	10	R,WM	€42.11+VAT
Andrea Miniatures	S5-B14	Commander bust - painted	10	R,WM	€222.48+VAT
Andrea Miniatures	S5-A28	Commander	32	WM	€17.35+VAT
Andrea Miniatures	S5-A29	Deck officer	32	WM	€17.35+VAT
Andrea Miniatures	S5-A30	Engine crewman	32	WM	€17.35+VAT
Andrea Miniatures	S5-A31	Seaman 1	32	WM	€17.35+VAT
Andrea Miniatures	S5-A32	Seaman 2	32	WM	€17.35+VAT
Frontier Models	S9B14	Silent Hunter Commander bust	10	R,WM	£42.95
Frontier Models	TR06	Günther Prien	16	R,WM	£51.95
Frontier Models	BU1	Erich Topp & periscope	180 mm	R,WM	£26.95
Diorama					
Accurate Armour	D12	Quayside deck/stair	35	R,WM	£107.65
Accurate Armour	D13	Quayside end	35	R,WM	£132.12
Accurate Armour	D14	Quayside complete	35	R,WM	£327.88
Accurate Armour	D15	Quayside mooring set	35	R,WM	£14.69
Accurate Armour	S03	Torpedo set	35	R	£24.41
Andrea Miniatures	S5-A38	Electric welding set	32	R,WM	€11.64+VAT
Andrea Miniatures	S5-A39	Mine	32	R	€16.10+VAT
Andrea Miniatures	S5-A40	VIIC anchor	32	WM	€6.51+VAT

Part III – 1/72nd scale

Manufacturer	Code	Subject	Scale	Materials	Price
Full hull kits					
Alanger	040005	XXIII	72	P	€38.50
Amati	1602	VIIB U 47	72	R,W,PE	£288.90
Combat Models	72-101	VIIC	72	V	\$47.95
Combat Models	72-107	IXC	72	V	\$47.95
Combat Models	72-108	IXD2	72	V	\$47.95
ICM	ICMS006	XXVIIB Seehund	72	P	£12.99
Revell	RV5015	VIIC	72	P	£49.99
Revell	RV5045	VIIC/41	72	P	£59.99
Special Navy	72001	IIA	72	P,R,PE,WM,D	£57.50
Special Navy	72002	XXIII	72	P,R,PE,WM,D	£48.60
Waterline kits					
CMK Maritime Line	ML80418	VIIC	72	R	£125.70 – future release
Towers (Both towers are for the 1/72 nd Revell RV5015 VIIC kit)					
HP-Models	Con-72-G-001	VIIC tower, tower details, periscopes	72	R,M	Out of production
Warhammer	WH001	Top half of VIIC tower, periscope, tower details	72	R,M,PE	Out of production
Accessories (Unless marked as otherwise, all accessories are for the 1/72 nd Revell RV5015 VIIC kit)					
Accurate Model Parts	72-01	IIA deck & accessories – for Special Navy IIA	72	R,PE,D,F	\$59.95
Accurate Model Parts	SAW-72	Sawfish decals	72	D	TBA

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Accurate Model Parts	A-72W	VII waterline	72	D	\$6.95
Accurate Model Parts	C-72N	VII snorting bull normal	72	D	\$6.95
Accurate Model Parts	D-72L	VII snorting bull large	72	D	\$6.95
Accurate Model Parts	DK-KMNE-80X135-072	Kriegsmarine flag 80X135cm	72	FF	\$5.95
Accurate Model Parts	DK-KMIC-80X135-072	Kriegsmarine Iron Cross Substitute 80X135cm	72	FF	\$5.95
Accurate Model Parts	DK-KMNE-100X170-072	Kriegsmarine flag 100X170cm	72	FF	\$5.95
Accurate Model Parts	DK-KMIC-100X170-072	Kriegsmarine Iron Cross Substitute 100X170cm	72	FF	\$5.95
Accurate Model Parts	DK-RMNE-80X135-072	Reichsmarine flag 80X135cm	72	FF	\$5.95
Accurate Model Parts	DK-UBPEN-072	Kriegsmarine U-boat Pennant set	72	FF	\$14.95
Accurate Model Parts	NAME-72-VIIC	VIIC brass nameplate	72	B	\$8.95
Accurate Model Parts	NAME-72-IIA	IIA brass nameplate	72	B	\$8.95
Archer Fine Transfers	AR88023	VIIC rivets	72	D	\$59.95
Bigpond	-	Dry-dock	72	R	AUS\$355.00 Out of production
CMK	CMK7201	Interior command section	72	R	£47.50
CMK	CMK7202	Interior torpedo section	72	R	£47.50
CMK	CMK7203	Interior engine section	72	R	£47.50
CMK	CMK7204	Exterior set	72	R	£27.99
CMK	CMK7205	Interior officer's ward room & galley	72	R	£43.20
CMK	CMK7206	Loading supplies at sea	72	R	£15.86
CMK	CMK7207	Torpedo loading winch at sea	72	R	£23.80
CMK	CMK7208	Rear torpedo loading hatch	72	R	£23.80
CMK	CMK7209	Deck winch for torpedo loading	72	R	£23.80
CMK	CMK72128	Dockside provision set	72	R	£7.99
CMK Maritime Line	ML80306	5 torpedoes	72	R	€22.50
Combat Models	72-101	Combat VIIC update	72	V	\$25.00
Combat Models	72-107	Combat IXC update	72	V	\$25.00
Combat Models	72-108	Combat IXD2 update	72	V	\$25.00
Dream Arts	1101	Rivet set for Revell VIIC	72	P	€99.00
Eduard	ED53008	Update set for VIIC	72	PE	£23.75
Eduard	ED53015	Set for Revell VIIC/41	72	PE	£25.70
Eduard	ED53022	Set for Special Navy XXIII	72	PE	£12.80
G-Factor	GFA17201	2 VIIC propellers	72	B	£13.50
Griffon Models	GMA-N005	Turm IV armament	72	B,PE,P	\$30.00
Griffon Models	GMA-N006	G7a/G7e torpedo	72	M,PE	-
Houshinya	-	VIIC periscopes	72	M	Out of production
Houshinya	-	VIIC gun barrels	72	M	Out of production
Kora	W7209	G7e torpedo	72	R,PE	-
Modelbrass	WM7201	VIIC deck & details	72	PE	\$40.00
Nautilus	72-001	Turm II conversion (actually Turm IV)	72	W,R,PE	Out of production

U-Boat Model Kits & Accessories

Nautilus	72-002	37mm + 20mm Flak38	72	W,R,PE	\$25.00
Nautilus	72-003	20mm Vierling	72	R,PE	\$20.00
Nautilus	72-004	Turm VI conversion	72	W,R,PE	\$35.00
Nautilus	72-101	Turm II conversion (resin only)	72	R	Out of production
Nautilus	72-102	Turm II conversion (PE brass only)	72	PE	\$20.00
Nautilus	72-501	VIIC early deck	72	W	\$38.00
Nautilus	72-502	VIIC Turm II deck	72	W	\$40.00
Nautilus	72-503	VIIC/41 planked deck with snorkel	72	W	\$40.00
Nautilus	72-504	VIIC/41 planked deck without snorkel	72	W	\$40.00
Nautilus	72-505	VIIC/41 planked deck fixed snorkel	72	W	\$40.00
Nautilus	72-506	VIID deck	72	W	\$40.00
Nautilus	72-507	IIA deck - for Special Navy	72	W	\$20.00
Raboesch	146-05	Propeller left	72	B	-
Raboesch	146-06	Propeller right	72	B	-
Schatton Modellbau	SMB7201	20mm Flak 38 barrel	72	B	\$7.95
Schatton Modellbau	SMB7238	20mm Flak 38 & antenna	72	B	-
Schatton Modellbau	SMB7239	G7a torpedo	72	B,PE	-
Schatton Modellbau	SMB7241	2 persicopes	72	B	-
Schatton Modellbau	SMB72150	2 persicopes for Special Navy IIA	72	B	-
Schatton Modellbau	SMB72151	G7e-T2 late-war torpedo	72	B,PE	\$19.00
Special Navy	SN72005	VIID conversion	72	P,R,PE,D	£18.50
U-Brass / White Ensign Models	UB001 / WEM7232	Flood, vent & drain holes	72	PE	£16.13+VAT
ULAD	ULAD7201	VIIC decals 1	72	D	£5.86
ULAD	ULAD7202	VIIC decals 2	72	D	£5.86
ULAD	ULAD7203	VIIC decals 3	72	D	£5.86
White Ensign Models	WEM7203	Update set	72	PE	£16.98+VAT
White Ensign Models	WEM7211	Torpedo loading set	72	R,PE	£13.57+VAT
White Ensign Models	WEM7212	Torpedoes	72	R,PE	£3.79+VAT
White Ensign Models	WEM7213	37mm	72	R,PE	£6.64+VAT
White Ensign Models	WEM7215	20mm Zwilling	72	R,PE	£4.55+VAT
White Ensign Models	WEM7231	Update set for VIIC /41	72	PE	Future release
Yankee Modelworks	YKM7201	Upper pressure hull	72	R	£36.55+VAT
Yankee Modelworks	YKM7202	VIIC update	72	WE	\$21.95
Figures					
CMK	CMK72116	3 on guard in tower	72	R	£7.99
CMK	CMK72117	3 loading supplies	72	R	£7.99
CMK	CMK72118	3 at rest part 1	72	R	£7.99
CMK	CMK72127	3 at rest part 2	72	R	£7.99
CMK	CMK72131	3 gun crew in action	72	R	£7.99
CMK	CMK72132	3 loading torpedo	72	R	£9.99
CMK	CMK72133	3 crewmen in tower on lookout at sea	72	R	£7.99
CMK	CMK72184	3 gun crew	72	R	£7.99
CMK	CMK72185	3 gun crew	72	R	£7.99
Frontier Models	S12S1	5 U-boat crew	72	WM	£19.00
Frontier Models	S12S3	7 U-boat crew 1	72	WM	£19.00
Frontier Models	S12S4	9 U-boat crew 2	72	WM	£19.00
Frontier Models	S12S6	8 U-boat crew 4	72	WM	£22.50

U-Boat Model Kits & Accessories

Frontier Models	S12S7	7 U-boat crew 5	72	WM	£22.50
Hecker & Goros	KSHG200	3 Commander, IWO, lookout	72	WM	\$15.00
Hecker & Goros	KSHG201	3 IIWO, lookout, machinist	72	WM	\$15.00
Hecker & Goros	KSHG202	4 lookout, signal, sailor, boatswain	72	WM	\$18.00
Hecker & Goros	KSHG203	4 gun crew	72	WM	\$18.00
Hecker & Goros	KSHG212	4 at sea	72	WM	\$18.00
Hecker & Goros	KSHG218	3 XXIII crew 1945	72	WM	\$18.00
Hecker & Goros	KSHG222	4 North Atlantic dress 1	72	WM	\$18.00
Hecker & Goros	KSHG224	4 North Atlantic dress 2	72	WM	\$18.00
Hecker & Goros	KSHG235	3 Type IIA figures	72	WM	\$18.00
Revell	RV2525	51 Kriegsmarine figures	72	P	£5.21+VAT
Warriors	WA72006	4 tower	72	WM	\$14.00
Warriors	WA72007	4 88mm gun crew	72	WM	\$14.00
Warriors	WA72008	4 20mm gun crew	72	WM	\$14.00
Diorama (CMK Maritime Line items allow a dry-dock scene to be built – available via White Ensign Models)					
CMK Maritime Line	ML80134	Steam crane	72	R	£23.49+VAT
CMK Maritime Line	ML80136	Guardhouse	72	R	£13.40+VAT
CMK Maritime Line	ML80228	Warehouse	72	R	£23.49+VAT
CMK Maritime Line	ML80283	2 rowing boats	72	R	£6.80+VAT
CMK Maritime Line	ML80286	2 tonne harbour crane	72	R,PE	£46.30+VAT
CMK Maritime Line	ML80290	Motor launch	72	R	£17.45+VAT
CMK Maritime Line	ML80292	Kriegsmarine divers	72	R	£8.72+VAT
CMK Maritime Line	ML80293	5 U-boat figures	72	R	£8.72+VAT
CMK Maritime Line	ML80294	5 sentries + dog	72	R	£8.72+VAT
CMK Maritime Line	ML80295	5 naval hospital staff	72	R	£8.72+VAT
CMK Maritime Line	ML80296	5 dockyard workers	72	R	£8.72+VAT
CMK Maritime Line	ML80297	5 dockyard workers on bicycles	72	R	£8.72+VAT
CMK Maritime Line	ML80299	Dry-dock walls	72	R	£20.13+VAT
CMK Maritime Line	ML80300	Stairs & corners	72	R	\$16.00
CMK Maritime Line	ML80302	Cobbled road sections	72	R	£15.40+VAT
CMK Maritime Line	ML80303	Cobbled road with tramlines	72	R	£15.40+VAT
CMK Maritime Line	ML80304	Dry-dock base sections	72	R	£10.04+VAT
CMK Maritime Line	ML80307	Sea mines	72	R	\$15.00
CMK Maritime Line	ML80342	5 German service personnel	72	R	£8.729+VAT
CMK Maritime Line	ML80350	Dry-dock support blocks	72	R	£6.80+VAT
Schatton	72161	5 SMA mines	72	R	€10.90

Part IV – 1/96th to 1/150th scale

Manufacturer	Code	Subject	Scale	Materials	Price
Full hull kits					
Academy	AC1442	IXB	150	P	£19.99
Doyusha	DH30011	VIIC U 581	150	P	£27.36
ICM	ICMS004	XXIII	144	P	£7.65+VAT
Fine Arts	VIIC	VIIC/41	96	Pre-built and painted	\$3495.00
Fine Arts	VIIC	VIIC/41 with camo	96	Pre-built and painted	\$4495.00
Mini Hobby Models	81201	XXI U 2518	144	P	-
Mini Hobby Models	81202	XXI Wilhelm Bauer	144	P	-
Revell	RV5004	XXI U 2540	144	P	\$21.99
Revell	RV5009	VIID	144	P	£14.99

U-Boat Model Kits & Accessories

Revell	RV5038	VIIC	144	P	£14.99
Revell	RV5054	VIIB U 99	125	P	£14.77+VAT
Revell	RV5060	VIIB U 47 with interior	125	P	£14.77+VAT
Revell	RV5078	XXI with interior	144	P	-
Revell	RV5100	VIIC/41	144	P	£14.99
Targa	71073	VIIC in 8 sections	144	M, pre-built & painted	\$89.95
Trumpeter	TP05907	XXIII prototype	144	P	£12.98
Trumpeter	TP05908	XXIII	144	P	£10.98
Towers					
Nautilus	-	Resin tower for Revell 1/125th U 99	125	R,PE	Out of production
Accessories (Unless marked as otherwise, all accessories are for the 1/144th Revell RV5038 VIIC kit)					
Accurate Model Parts	SAW-144	Sawfish decals	144	D	TBA
Accurate Model Parts	B-144W	VII waterline	144	D	\$6.95
Accurate Model Parts	E-144N	VII snorting bull normal	144	D	\$5.95
Accurate Model Parts	F-144L	VII snorting bull large	144	D	\$5.95
Accurate Model Parts	DK-KMNE-80X135-096	Kriegsmarine flag 80X135cm	96	FF	\$5.95
Accurate Model Parts	DK-KMIC-80X135-096	Kriegsmarine Iron Cross Substitute 80X135cm	96	FF	\$5.95
Accurate Model Parts	DK-KMNE-100X170-096	Kriegsmarine flag 100X170cm	96	FF	\$5.95
Accurate Model Parts	DK-KMIC-100X170-096	Kriegsmarine Iron Cross Substitute 100X170cm	96	FF	\$5.95
Accurate Model Parts	DK-RMNE-80X135-096	Reichsmarine flag 80X135cm	96	FF	\$5.95
Accurate Model Parts	DK-KMNE-100X170-125	Kriegsmarine flag 100X170cm	125	FF	\$5.95
Accurate Model Parts	DK-KMIC-100X170-125	Kriegsmarine Iron Cross Substitute 100X170cm	125	FF	\$5.95
Eduard	EDU17022	Update set	144	PE	£12.80
Griffon Models	N144001	Update set	144	PE,M,D	-
Griffon Models	N144002	For 144th VIID	144	PE,M,D	-
Griffon Models	GMA-N001	Periscope and barrel	144	M,PE	-
Griffon Models	GMA-N002	Torpedo	144	M,PE	-
Via Euromodels	GR11001	For ICM XXIII	144	PE	£12.35

Part V – 1/200th to 1/700th scale

Manufacturer	Code	Subject	Scale	Materials	Price
Full hull kits					
AFV Club	SE73501	XXI	350	P	£13.65
AFV Club	SE73502	VIIB	350	P,PE	£12.98
AFV Club	SE73503	VIIC	350	P,PE	£14.98
AFV Club	SE73505	VIID	350	P,PE	Future
Artitec	55-107	VIIC	350	P or R	\$21.95
Blue Water Navy	35027	IIB	350	R	-
Blue Water Navy	35028	VIIC	350	R	-
Blue Water Navy	35032	XXI	350	R	-
Commander Series	CSM8-002	IXC	350	R	\$27.12
Dragon	1008	XXI	350	P	-
Flagman	FL235003	VIIC/41	350	P	£7.82
Flagman	FL235005	IXA/B	350	P	Future
Flagman	FL235006	VIIC	350	P	-
Flagman	FL235009	VIIB	350	P	Future
Flagman	FL235010	IXC	350	P	Future
Flagman	FL235014	IXC/40 early	350	P	Future

U-Boat Model Kits & Accessories

Flagman	FL235022	VIIC Flak	350	P	£7.99
Flagman	FL235030	IXD2 early	350	P	Future
Gulfstream	-	VIIC late war	350	P or R	-
Hobby Boss	HB87006	IXB	700	P	£3.99
Hobby Boss	HB87007	IXC	700	P	£3.99
Hobby Boss	HB87008	VIIB	700	P	£3.99
Hobby Boss	HB87009	VIIC	700	P	£3.99
Mirage Hobby	MIR40023	IIA U 2	400	P	£4.88
Mirage Hobby	MIR40024	IIB U 23	400	P	£4.88
Mirage Hobby	MIR40025	IIC U 60	400	P	£4.88
Mirage Hobby	MIR40026	IID U 149	400	P	£4.88
Mirage Hobby	MIR40041	IXC U 176	400	P	£8.35
Mirage Hobby	MIR40042	IXB U 511	400	P	£7.43
Mirage Hobby	MIR40044	IXC/40 U 803	400	P	£8.35
Mirage Hobby	MIR40045	IXA U 40	400	P	£8.40
Mirage Hobby	MIR40049	VIIC U 571	400	P	£8.40
Mirage Hobby	MIR40410	VIIB U 84	400	P	£7.43
Mirage Hobby	MIR40411	VIIC U 570	400	P	£8.35
Mirage Hobby	MIR40412	VIIC Turm II U 673	400	P	£7.43
Mirage Hobby	MIR40413	VIIC Turm IV U 826	400	P	£7.43
Mirage Hobby	MIR40414	VIIC/41 U 295 + Biber	400	P	£8.40
Mirage Hobby	MIR40415	VIIC/41 U 1064	400	P	£8.15
Mirage Hobby	-	IXD2 Turm II U 875	400	P	-
Nichimo	2009	IXB U 107	200	P	\$15.00
Nichimo	2010	IXC U 505	200	P	\$15.00
Planet Models / CMK	PLANS 001	IA	200	R	£46.40
Planet Models / CMK	PLANS 002	XXI	200	R	£46.40
Planet Models / CMK	PLANS 003	IIA	200	R	£29.99
Planet Models / CMK	PLANS 004	IIB	200	R	£29.99
Planet Models / CMK	PLANS 005	IIC	200	R	£29.99
Planet Models / CMK	PLANS 006	IID	200	R	£29.99
Planet Models / CMK	PLANS 007	Molch	200	R	£10.80
Planet Models / CMK	PLANS 008	Hecht	200	R	£10.80
Planet Models / CMK	PLANS 009	Biber	200	R	£10.80
Planet Models / CMK	PLANS 010	Seehund	200	R	£10.80
Planet Models / CMK	PLANS 011	XXIII	200	R	£29.99
Revell	3102	IXC U 505	200	P	\$20.00
Revell	RV5093	VIIC	350	P	£6.99
Yankee Modelworks	YKM-35027	VIIC late war	350	R,PE,WM	\$60.00
Yankee Modelworks	YKM-35028	IXC late war	350	R,PE,WM	\$60.00
Yankee Modelworks	YKM-35032	XXI	350	R,PE	\$30.00
Waterline kits					
Hasegawa	44126	VIIC & IXC	700	P	\$8.99
HP Models	WW II-WL -G-02	I & II	700	R	€16.00
HP Models	WW II-WL -G-051	XXI 1945	700	R	€10.00

U-Boat Model Kits & Accessories

HP Models	WW II-WL -G-052	XXIII set of 4	700	R	€16.00
HP Models	WW II-WL -G-052A	XXIII set of 4 – series 1	700	R	€16.00
HP Models	WW II-WL -G-113	VIIB U 47	700	R	€10.00
HP Models	WW II-WL -G-113	VIIB U 47	700	R	€11.00
HP Models	WW II-WL -G-114	VIIB U 83	700	R	€11.00
HP Models	WW II-WL -G-115	VIIC U 201	700	R	€11.00
HP Models	WW II-WL -G-116	VIIC/41 U 1105	700	R	€11.00
HP Models	WW II-WL -G-117	VIIC U 441 U-Flak	700	R	€11.00
HP Models	WW II-WL -G-118	VIID U 218	700	R	€11.00
HP Models	WW II-WL -G-119	VIIF U 1060	700	R	€11.00
HP Models	WW II-WL -G-120	IXA U 40	700	R	€11.00
HP Models	WW II-WL -G-121	IXA U 37	700	R	€11.00
HP Models	WW II-WL -G-122	IXB U 106	700	R	€11.00
HP Models	WW II-WL -G-123	IXB U 103	700	R	€11.00
HP Models	WW II-WL -G-124	IXC U 66	700	R	€11.00
HP Models	WW II-WL -G-125	IXC U 507	700	R	€11.00
HP Models	WW II-WL -G-126	IXC U 532	700	R	€11.00
HP Models	WW II-WL -G-127	IXC/40 U 869	700	R	€11.00
HP Models	WW II-WL -G-128	IXD U 180	700	R	€11.00
HP Models	WW II-WL -G-129	IXD U 195	700	R	€11.00
HP Models	WW II-WL -G-130	IXD2 U 862	700	R	€11.00
HP Models	WW II-WL -G-171	XB U 118	700	R	€11.00
HP Models	WW II-WL -G-172	XB U 119	700	R	€11.00
HP Models	WW II-WL -G-173	XB U 219	700	R	€11.00
HP Models	WW II-WL -G-174	XB U 233	700	R	€11.00
HP Models	WW II-WL -G-175	XB U 234	700	R	€11.00
HP Models	WW II-WL -G-176	XIV U 459	700	R	€11.00
HP Models	WW II-WL -G-177	XIV U 461	700	R	€11.00
HP Models	WW II-WL -G-178	XIV U 462	700	R	€11.00
HP Models	WW II-WL	XIV U 490	700	R	€11.00

U-Boat Model Kits & Accessories

	-G-179				
Accessories (Unless marked as otherwise, all accessories are for the 1/400th Mirage kits)					
Accurate Model Parts	SAW-350	Sawfish decals for 350 th scale VIIC	350	D	TBA
Mirage Hobby	24001	IIA U 3 update	400	R,PE	-
Mirage Hobby	24002	IIB U 14 update	400	R,PE	-
Mirage Hobby	24003	IIC U 57 update	400	R,PE	-
Mirage Hobby	24001	IID U 141 update	400	R,PE	-
Mirage Hobby	44001	VIIB U 83 update	400	R,PE	-
Mirage Hobby	44002	VIIC U 556 update	400	R,PE	-
Mirage Hobby	44003	IXA U 37 update	400	R,PE	-
Mirage Hobby	44004	IXC U 154 update	400	R,PE	-
Tom's Modelworks	4019	For 5 VIIs	400	PE	\$16.00
Voyager	VN35001	For AFV VIIB	350	R,PE	£6.77+VAT
Voyager	VN35002	For AFV VIIC	350	R,PE	£6.77+VAT

Part VI –Manufacturer & Supplier Websites

White Ensign Models

White Ensign Models Kriegsmarine paints		
Code	Paint	Price per tin
KM01	<i>Hellgrau 50</i>	£1.32+VAT
KM02	<i>Dunkelgrau 51</i>	£1.32+VAT
KM05	<i>Schiffsbodenfarbe III Grau</i>	£1.32+VAT
KM06	<i>Dunkelgrau 2</i>	£1.32+VAT
KM11	<i>Schlickgrau 58</i>	£1.32+VAT
KM12	<i>Blaugrau 58.1</i>	£1.32+VAT

ULAD decals

ULAD decals	
Code	U-numbers
ULD72001	U 79, U 82, U 95, U 96, U 132, U 136, U 201, U 202, U 204, U 212, U 235, U 302, U 558 & U 564
ULD72002	U 71, U 72, U 81, U 92, U 97, U 134, U 205, U 209, U 221, U 223, U 231, U 238, U 255, U 404, U 458, U 564, U 593 & U 601
ULD72003	U 94, U 332, U 333, U 334, U 407, U 453, U 556, U 565, U 571, U 592, U 596, U 617, U 751, U 755 & U 757

Manufacturers

Manufacturers	
Name	Website
Accurate Model Parts	http://amp.roknet.biz
Alanger	http://www.alanger.ru
Amati	http://www.amatimodel.com
Andrea Miniatures	http://www.andrea-miniatures.com
Archer Fine Transfers	http://www.archertransfers.com
Combat Models	http://combatmodels.us
CMK / CMK Maritime Line	http://www.cmkkits.com/en/page/about-us

U-Boat Model Kits & Accessories

Dream Arts	http://www.dream-arts.de
Eduard	http://www.eduard.cz
Engel	http://www.engel-modellbau.de
Fine Arts	http://www.fineartmodels.com
Flagman Models	http://www.flagman-models.com
Frontier Models	http://www.frontiermodels.co.uk
G-Factor Models	http://www.gfactormodels.com
Griffon Models	http://www.griffonmodel.com
Hecker & Goros	http://www.hecker-goros.de
HP Models	http://www.hp-models.com
ICM	http://www.icm.com.ua/en
Kora	http://www.lfmodels.cz
Krick	http://www.krick-modell.de
Mirage Hobby	http://www.mirage-hobby.com.pl
Modelbrass	http://www.modelbrass.com
Nautilus	http://nautilusmodels.com
OTW Designs	http://www.otwdesigns.com
Precision Pattern	http://precisionpattern.biz/subs/
Raboesch	http://www.raboesch.com
Robbe	http://www.cms.robbe.de
Schatton Modellbau	http://modellbau-schatton.privat.t-online.de
Special Navy	http://www.cmkkits.com/en/page/about-us
Tom's Modelworks	http://www.tomsmodelworks.com
U-Brass	Now Accurate Model Parts
Verlinden	http://www.verlindenonline.com
Voyager	http://www.voyagermodel.com
White Ensign Models	http://www.whiteensignmodels.com
Yankee Modelworks	http://www.yankeemodelworks.com

Suppliers

Suppliers	
Name	Website
Euromodels	http://www.euromodels.co.uk
Hannants	http://www.hannants.co.uk
Models by Mickster	http://www.modelsbymickster.com
White Ensign Models	http://www.whiteensignmodels.com

Super-detailing Revell's 1/72nd Type VIIC U-Boat

by Wink Gris 

with contributions by Dougie Martindale

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- ⊕ Part II Choosing A Boat
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- ⊕ Part VI Painting &
Weathering
- ⊕ Part VII Decals
- ⊕ Part VIII Finishing Touches



Above (H1): The following article charts how Wink Gris  of Accurate Model Parts built his U 557 model from Revell's Type VIIC kit.

Part I – U-Brass Project

A one meter / 36 inch long Type VIIC U-boat model demands a certain investment by the modeller. Time and money of course, but also respect, and maybe a little love. This is especially so of the super detailer. Often the countless hours spent collecting and analysing research material can eclipse actual building time at the modelling bench. While research inevitably leads to increased knowledge, it also can lead to a respectful appreciation for the subject at hand.

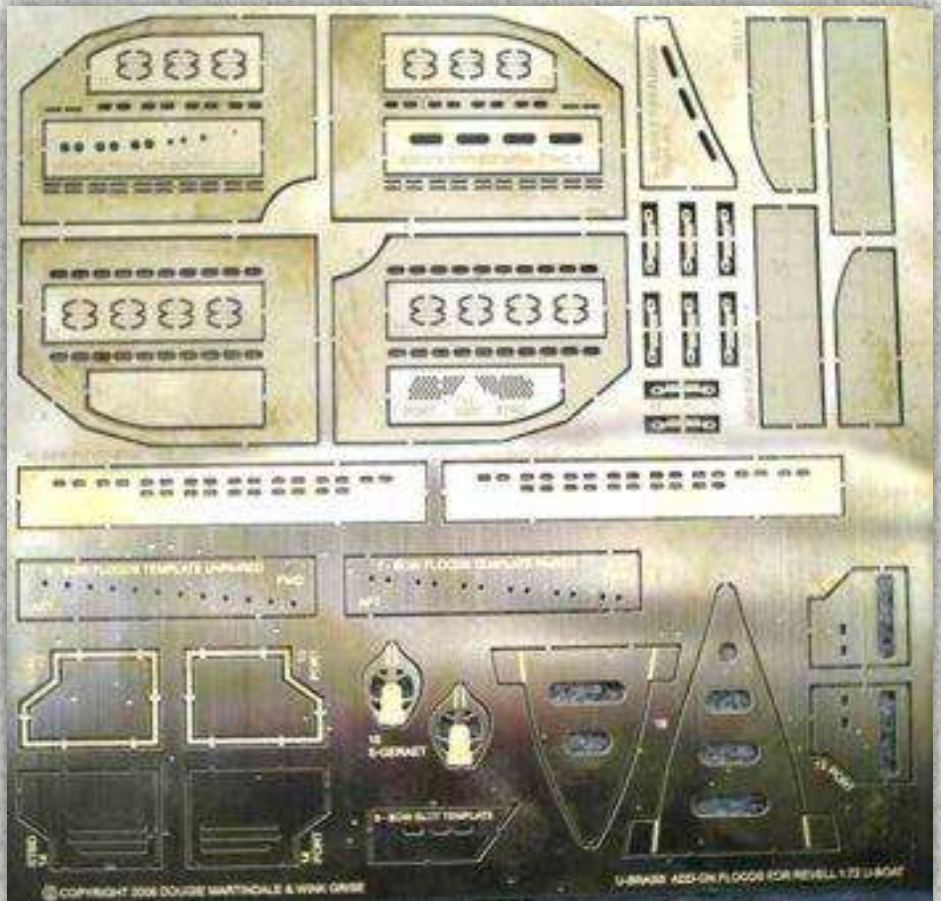
Having bought the 1/72nd Type VIIC U-boat (RV5015) model kit, I gathered as much information about U-boats as I could. Much came from communicating with others over the net. In fact, without friendly modellers offering information, research and advice through forums, the model would have been just a kit glued together. Internet forums are fantastic methods of communicating with other like-minded enthusiasts, allowing us to appreciate our subjects and produce models far more accurate than was possible a decade ago.

One forum mate I met was Jess Montgomery. Jess has completed a number of the Revell models, both for himself and for customers. He sent me Dougie's *Type VIIC Free-Flooding Vent Patterns* article. The photos and drawings in the article showed there was much more to the boat than just the kit. The aftermarket sets did not address these areas that needed attention. I contacted Dougie through Jess, tentatively asking whether he would be interested in co-designing a photo-etch (PE) set to address the Revell inaccuracies not covered by other sets. Dougie saw in me a modeller like himself, who wanted to produce something to increase the accuracy of his own model, and so agreed. I don't think either of us are truly "rivet counters", but we do feel a passion for accurately depicting our subjects. Over months we completed the set, striving as best as possible for accuracy.

Together we decided which PE parts we would like to see that did not feature on any other sets. The main feature of our set was the large “cheek piece” which we designed to fit the area surrounding both torpedo doors. The set included the following -

- four large cheek pieces to correct the over-long torpedo doors. There were two versions - one to allow bow pattern B (and with modification A and D), and the other to allow the VIIB bow pattern
- new torpedo doors of the correct length, with rivet detail (the rivets are not etched; rather the area around them are etched halfway through)
- two pieces for the medium-sized vents above the central drainage area. The vents are paired on these pieces, with rivet detail
- two drill templates for the twelve vents near the bow. The holes are a smaller diameter than the kit. One piece is the evenly spaced arrangement, the other paired
- drill template for the main free-flooding vents
- drill template for the 2/3 vents near the stem
- drill template for the three vents at the rear of the saddle tanks
- drill template for the curved line of vents above central drainage area (paired)
- drill template for the small vents on the side of tower (U 201 pattern used)
- pieces for exhaust outlet styles 4 and 5
- internal torpedo braces (replacing Revell parts 14 and 15)
- S-Gerät bow piece (plus spare)
- turnbuckles for the jumping wires
- tensioners for the jumping wires

Designing photo-etched brass sheets may seem scary and daunting - the sole province of professional manufacturers in the business - but it is most definitely within the capabilities of many modellers! With knowledge and practice it is very “do-able”. And it isn't overly expensive, particularly when compared to how much is spent on various aftermarket sets (unfortunately my wife started adding up what I have spent on this model alone...). It does require research and time, but so do most branches of modelling.



The brass sheet was manufactured by a company in the UK called Chempix (which is a division of Precision Micro Ltd.). Few companies are excited about producing small and short runs, but

Above (H2): The U-Brass set.

Chempix was very accommodating. There were a few design boundaries such as minimum gap and hole sizes. Once our design was finalised we printed it on paper to make sure all the parts were the correct sizes. Having checked the design time and again, we had the computer file printed to film at 2400 dpi resolution by a digital print house (aka service bureau). We sent the film to Chempix and they produced the sets as oversize A3 (450 x 300mm, or oversize 11" x 17") with six sets per sheet on .38mm brass (.015").

Next we produced a test sheet, and then an initial run, along with decals for the three pairs of white waterline indicator markings that featured on U-boats. When the batch sold out, White Ensign Models (WEM) - a respected model retailer in the UK probably known to many readers for their custom paint and PE sets - bought the rights. It is now available as the WEM7232 "Flood, drain & vent holes" set. (We highly recommend it!)

And so our U-Brass project was complete.

Part II – Choosing A Boat

One of the most enjoyable decisions before we get blobs of glue on our fingers is which particular VIIC we will model. Some modellers prefer to depict their boat on a particular date, or a certain time frame. There are literally hundreds of VIICs to choose from, and it is always interesting to hear which boats modellers have chosen, and their reasons.

Many factors influence this decision. Sometimes a modeller wants to have certain features (net cutters, breakwaters, wind defector) either present or missing, or a particular combination. This might narrow down our choice of boat. Sometimes modellers might choose a certain boat because they have found a few photos in books and/or the internet, and have clues to colour schemes and which features were present.

Other common factors which influence our choice are how successful the boat and/or commander was, or even the character of the commander himself. It could be that a relative served on board a particular boat, or even fought against a certain boat. Quite often a camouflage style or a colourful or humorous insignia can take our fancy and dictate which boat to model.

When considering which boat I wanted to model, *Das Boot* (U 96), one of the very successful and famous boats, came to mind right away. But a "*Memphis Belle*" of the Kriegsmarine doesn't really capture the strain, monotony, minor individual victories, and frustration of everyday U-boat life. After re-reading *Iron Coffins* by Herbert Werner, the choice was obvious: U 557, the first boat Werner served aboard, and a typical boat with slight-to-moderate success and a short life. I chose to depict U 557 in October 1941 (preparing for a patrol) because the boat was experienced by then, enjoyed some "good hunting", and at the end of that patrol Werner left U 557 to sail on other boats.

Was this a good choice in practical modelling terms? Just barely. There were no photos of U 557 available at the time. This can be a serious problem! Fortunately there are ample photos ("ample" because there are never enough!) of U 552, a famous boat, and even some of U 558, another known boat, both in the same series and built at the same yard. So any major questions about equipment were answered by looking to sister boats.

Part III – The Hull

Bow

S-Gerät - The S-Gerät (*Sonder-Gerät für aktive Schallortung*) or "Special equipment for active sound location" was a complete sound system to detect targets. The bulk of the system was in the conning tower, and was a primary part of upgrading the VIIB to VIIC (more space was needed!). Though the S-Gerät outfitting was delayed, many early boats were at least fitted with the bow device. By 1943 the

system was dropped in favour of more radar. As a result, the S-Gerät housing did not feature on later VIICs.

Photos of other *Blohm & Voss* boats in the U 551 series show the presence of the S-Gerät bow device, so it is essential for a U 557 model. The kit does not provide one, so we added one to our U-Brass PE set. The brass part should be curved and glued to a plastic custom-piece that is placed on the edge of the bow near torpedo door height, blended to the hull casing with putty (conventional or epoxy).

Bow vents - The top vent holes (row of 12 circular holes at the top of the hull casing, behind the bow) are too large on the kit and only depict one pattern of evenly spaced holes. U 557 used the other pattern - paired holes - which featured on early VIICs built at the *Blohm & Voss* shipyards. U-Brass provides two metal templates (both styles) that can be used as a direct replacement or as a drill template. To close the existing holes, either glue plastic tubing into the holes, or chop out the row and substitute a new piece with drilled holes. Both methods have pros and cons. The tubing tends to be weak and pop out; the replaced piece eats rivets around its seams (more on rivet replacement later).

On the kit there are three oval holes on either side of the hull casing, just behind the U-boat's stem. There should be just two of these "bow vents" on the starboard side, and they should be moved forward and made slightly smaller. The port side has three, again forward and smaller. U-Brass provides a drill template to make new ones: first block the kit holes by chopping them out or making them into rectangles, then replace or plug with sheet plastic. Once thoroughly glued and dry, the template can be used to locate and cut new holes.

Torpedo doors - Next we come to the torpedo doors, and their surrounding vent holes. It is here we find two of the largest gaffes by Revell. First, the torpedo doors are a **full 7mm** (.275") too long. Many careful measurements of several photos, averaged and triple checked, show that the doors were unmistakably shorter. The top door, at 42mm long, should only be 35mm (1 and 3/8ths") long. The shape of the bottom door is not quite right either. The second gaffe relates to the holes above and below the top torpedo doors: the kit vent holes around the doors are rectangular, when the real ones were oval-ended rectangles. There were also three major vent patterns, depending on the yard. The overlong doors and the rectangular shaped holes really do look noticeably wrong on the kit, and warrant attention.

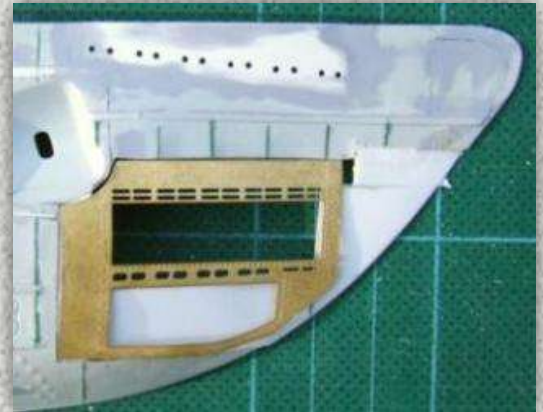
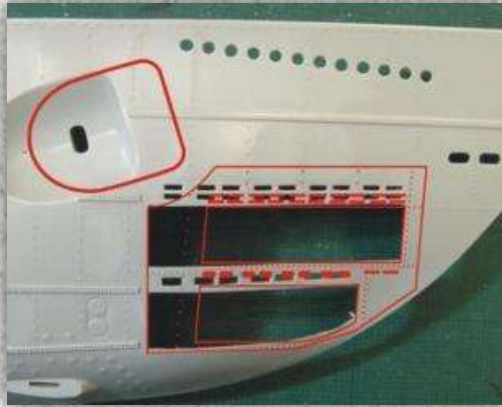


Above (H3): The S-Gerät bow device on the stem of U 557. The white markings are the waterline indicator decals (available from AMP).

Below (H4): The nose was also corrected.



The U-Brass PE kit corrects this by providing “cheek pieces”: the torpedo doors (separate) and surrounding vents in different patterns. To



Above left (H5): The red lines that are superimposed upon the Revell kit show the placement of the U-Brass cheek piece. These illustrate the incorrect length of the Revell torpedo doors.

Above right (H6): The cheek piece in position. Note the 12 circular vent holes above, which were arranged in pairs on some boats.

install the U-Brass cheeks, they must sit flush to the hull. There are three methods: rebate (make a lip so the PE sits flush but is supported); make a press fit and put epoxy putty behind for support; or build a shelf. I chose the simple and stronger rebate method (large glue surface area) and scraped a thin indent with a very sharp knife. There is enough room between the PE seam and other rivets to avoid wiping them out when you putty.

I chose to model one torpedo door open. This meant that I had to modify kit part 16 (bulkhead with torpedo tube), because it had to come forward now to fit the newly shortened and positioned doors. Only one tube would show, so I didn't have to modify the entire piece to fit farther forward, but built a new, one-tube piece instead. I used a small piece of sheet and some plastic tubing, thinned on the edge to scale thickness. In addition I built support framework behind the very visible torpedo vents (C and D decks), out of thin sheet plastic. Drawings in David Westwood's *Anatomy Of The Ship: The Type VII U-Boat* (hereafter referred to as “Westwood Anatomy”) were used as a guide.

Once assembled, the fiddly inner framework effort is hardly visible, but without it the model looks like an empty shell. I placed the nose of a resin aftermarket (AM) torpedo in the tube.

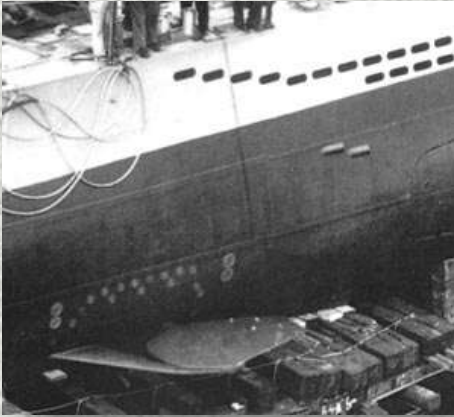
Anchor - The kit anchor well is deep, sharp, and too far aft, especially once the torpedo doors have been shortened. I cut out the well and moved it forward 10mm (approx 3/8ths”). The U-Brass cheek pieces helped with placement. Some rivets were lost (temporarily!). I added epoxy putty to the well to shallow it and make it look a little more like the photos: simply a slightly bent metal recess to stow the anchor, instead of a sharply recessed molded well.

The kit anchor itself is satisfactory, but I found a “3mm nautical scale” cast alloy anchor that I liked better. I reshaped the base with a file and added two rivets out of gel type cyanoacrylate (CA or superglue gel). This worked well enough for the large, flat anchor rivets, but is not a great rivet replacement for other uses because the gel shrinks, widens and flattens while drying. I gave the anchor my special “cast metal look” by adding powdered graphite to black paint and applying with an old brush. Once dry, I sanded lightly, crushing some but not all of the graphite, giving a real bumpy sand-cast look. Powdered graphite is available at most hardware stores as an industrial lubricant and makes a very believable scale cast look.



Right (H7): Powdered graphite was added to black paint to improve the look of the cast alloy anchor. The anchor recess was moved forward by 10mm.

The 2 “bumps” - Their purpose is unclear. It has been suggested that air may have been expelled from these bumps after firing torpedoes. However, there are two grills on the deck - one near the bow, the other near the stern. It is likely that air was expelled through these grills rather than the two bumps. Whatever their purpose, they should be moved 7mm higher and 7mm farther aft.



Above (H8): This photo of U 69 shows 15 GHG diaphragms between the 4 UT membranes. The position of the two “bumps” can also be seen directly below the main vent holes.

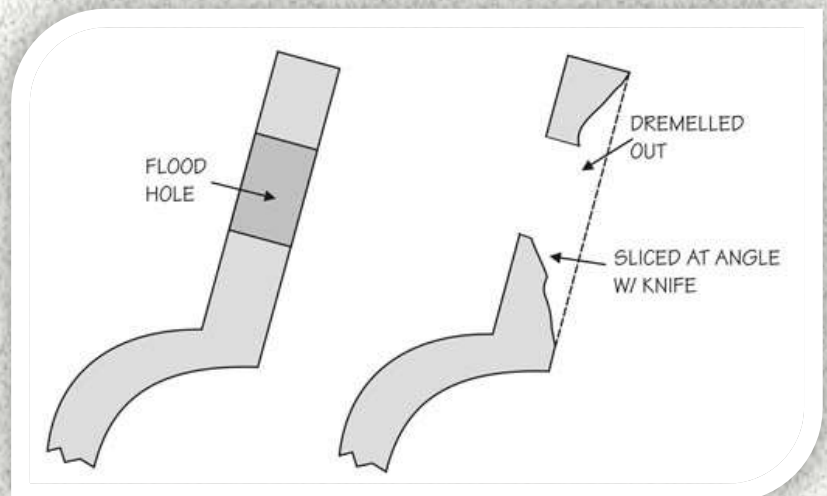
Dive plane position, GHG and UT - Thankfully the forward dive plane and guard appear to be in the correct place (phew!). Surrounding the forward plane guard are raised circles of 1mm diameter. These are the receiving diaphragms for the *Gruppenhorchgerät* (GHG or group listening apparatus), a system for detecting underwater noise. Also in this area are the two *Unterwasser Telegraphie* (underwater telephone) membranes - one for transmission and one for receipt of sound waves. Each membrane contains two circles of 2.5mm in diameter. There was (as always with VIICs!) a variation in the pattern of GHG diaphragms between boats. While the Revell pattern is visible on some VIIC photos, other boats such as U 69 had 15 (rather than 2) diaphragms between the UT membranes, with more farther down.

Free-flooding vent holes

Main pattern - The kit has many flood/vent holes, too many to depict any actual boat! Different boat yards used slightly different vent patterns. U 557's pattern required a few vents to be moved or blocked, and a few added.

The kit “holes” are just indents and have to be cut out. The simplest and easiest method is to use a Dremel tool to thin the back until it either disappears and breaks through, or gets very thin and can be cut with a sharp #11 X-acto blade. This is much faster and produces a better result than drilling or filing through the thick plastic. For added realism I thinned the edges of the holes to give the illusion of scale hull thickness. The real boats were 18mm (3/4”) thick, later thickened to 25mm (1”) with the VIIC/41. Scale thickness is 0.25mm (.010”). I didn't caliper each hole but just made them as thin as I dared.

The U-Brass set includes templates for creating new vent holes to cover any pattern. Holes can be blocked with sheet plastic and seams covered with putty.



Above: A diagram of the method used to drill out the flood holes.

Front free floods - The Modelbrass pieces for the free-flooding holes behind the forward dive planes are the true oval shape, as opposed to the disappointing rectangles in the Revell kit. On some VIICs the smaller group of holes (offset from the main group) should be filled in.

Bottom free floods - The museum boat U 995 was used as the basis of the pattern on Modelbrass' rear free-flooding pieces because there was no other source available. Once again Revell's rectangular shaped holes were amended to their true oval shape.

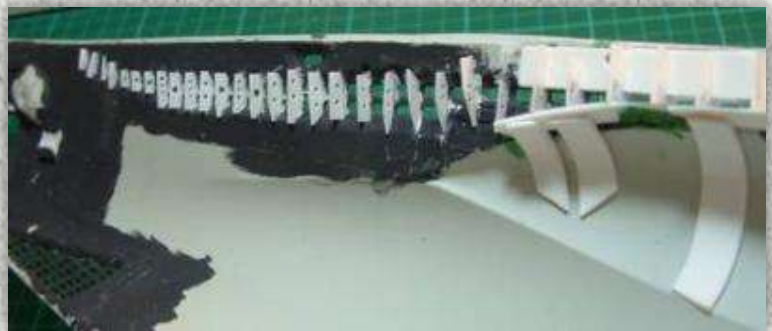
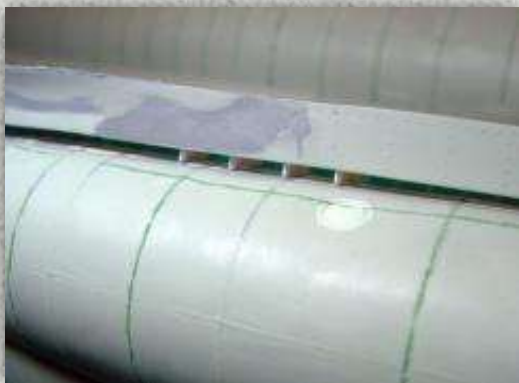
A number of modellers have commented on the difficulty in fitting this piece, given that it needs to be bent to the correct shape. However, the tricky task is worthwhile as the piece is far more prototypical than this area of the Revell kit is. I used a combination of the rebate method and thin styrene inner shelf pieces, and CA, and crossed my fingers. The pieces are in very solid and have not been a problem.

Main hull

Saddle tanks - With the long slot cut out, the saddle tanks have to be extended under the slot and in towards the pressure hull. Otherwise the illusion of a miniature submarine is broken. I glued a strip of sheet plastic under the lip of the tanks as a support shelf, then glued another strip on top to serve as the extended tank.

I cut out the long slot amidships and added vertical supports behind to match the real boats, spaced at about 8.3mm or .315" (60cm in full scale), matching the rivet spacing where the ribs would be. I used the thinnest plastic I could find, then filed the edges even thinner into a "V".

There are two vertical pipes that come up from the saddle tanks, so I used thin rod and made a flat base to match photos.



Top right (H9): The long slot amidships was removed.

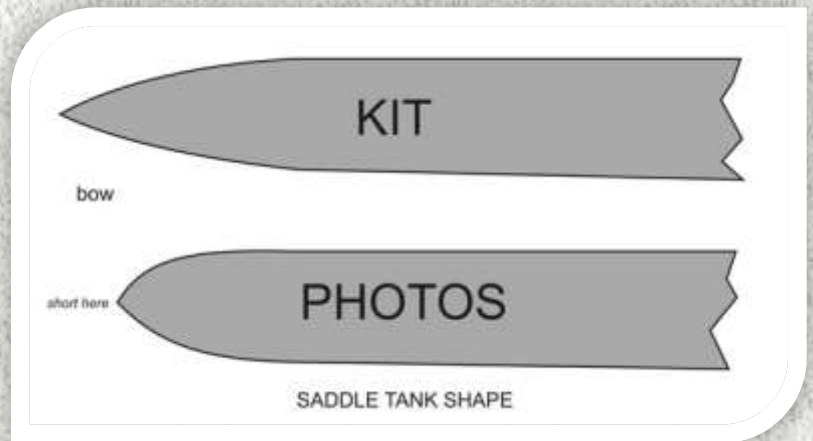
Above left (H10): Ribs were then added at around 8.3mm intervals.

Above right (H11): Vertical sides were then added to the ribs.

Right (H12): One of the scratch built vertical pipes.



Snub nose - The kit saddle tanks have a very thin, pointed forward nose, but many photos of actual boats show a snub nose (a thicker, shorter and more severe curve). Even considering angle and lens foreshortening, the kit tanks seemed too pointed. I Dremelled off the tips flush to the hull. Fortunately Revell molded the hull very thick, which saved me a lot of rebuilding and hole-patching!



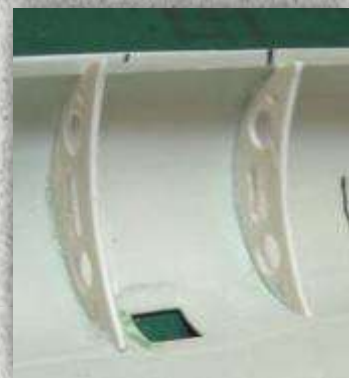
Above: A guide to the difference shapes on the front of the saddle tanks.

Below (H13): The re-shaped starboard saddle tank.

For the new shape I used a grid system to match to landmarks like the vents, but that ended up looking severely different to the photos. Angle and scale and tiny Revell adjustments must have been accumulating to some kind of error, so I “eyeballed” it in the end. Once I had one side satisfactory, I used a cardboard template to set the matching shape on the other side. Using the Tamiya “regular” on port, and the “quick dry” on starboard, I re-sculpted the tank noses with epoxy putty. I found the quick dry to be difficult to sculpt due to a slightly different texture and consistency.



Covers - The top of the saddle tanks have five “detail bits”, either round or oval covers. Westwood Anatomy lists these as both “outlet valves for diving tanks” and “flooding/blowing vents”. The PE that replicate these (WEM and Eduard) are pretty faithful to Westwood Anatomy. But photographs of the 55X series show the pieces as large and manhole-like, as if they were inspection covers. WWII US Gato submarines had inspection covers, so there is certainly logic for them. Some knowledgeable U-boat enthusiasts are adamant that they **were** indeed manhole inspection covers.



Whatever they were, I think I came close to replicating them by studying the photos. I marked off the approximate locations and drilled pilot holes, then enlarged. I filled with epoxy putty from behind and while still curing,

used the flat end of a drill bit from the front to just leave a slight impression. The bit's chamfered edge left a nice angled inner edge to the covers. When dry, I drilled two micro surface holes in



Above (H14): Internal ribs added inside the Revell hull sides.

Left (H15): The pilot holes for the round shaped covers.

each cover, not all the way through. I cannot be certain these are completely accurate, but photos show some kind of hole/bolt-like pieces.

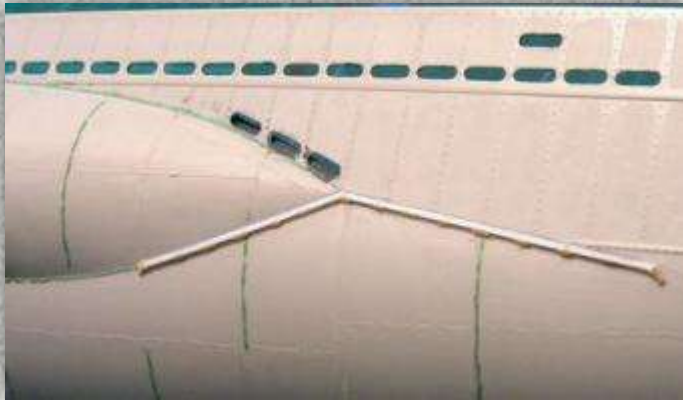
I added PE grills to the bottom middle of the tanks. For the central grill I cut out a hole, built a curved piece in deep behind to represent the pressure hull. This internal piece is not visible, so for the other grills I just whacked them on top of the holes.

Just aft of the tanks are three thin slots, similar to the main vents but thinner. I cut these in before making the U-Brass cutting template, so they ended up a tad large, but the template will help others with placement and size. I then added epoxy putty behind to show the continuation of the saddle tank. The pressure hull meets this, completing the illusion.

Drain channels - These mark the division between the pressure hull and the hull casing. Few photographs show much detail, but they seem to be square, tubing-like channels, perhaps for drainage. They are more visible on U 995, but U 995 has been altered and not maintained as historically accurate. U 995 is a dangerous source for information! The channels are moulded the correct size on the Revell kit, but the vertical line extends about 10mm or so too far forward. Unfortunately, to rectify this, a great

deal of patience and effort are needed to rebuild. Most modellers will be content to leave this be. I did!

I did redo the channels themselves, however, with quarter round plastic strip. That may sound odd, but the end effect seems more like the photos, though perhaps slightly too thick.



Left (H16): The drain channels depicted with quarter round plastic strip.

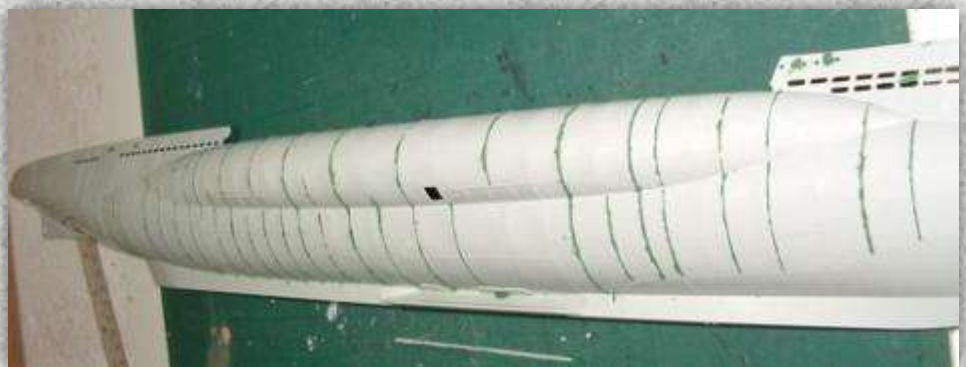
Doublers - The horizontal strips that feature on the hull casing of VIICs were known as “doublers.” These steel strips were added on top of weld seams for additional strength. Their size and position, mostly correct on the Revell hull, are one of the highlights of the kit.

Weld seams - The raised lines on the saddle tanks and hull casing are meant to be weld seams. They are too large and should be sanded down. Though they could be seen, these weld seams were nowhere near as prominent as the “drain channels.”

I sanded and attacked the seams with a sharp blade, making fluid wrist undulations in two directions. The result: uneven width and thickness seams that look a lot more like real welds.

Below (H17): Altered weld seams.

Altered welds - After closely examining photos I realised there were many more weld seams on the real boats. The photos were not detailed enough to create an accurate (or even rough) seam chart, so I used my own judgment and added



more welds until the “feel” seemed right. I think I could be more accurate now if I created a chart, but there would still be gaps.

To make the new welds I used a simple and odd-seeming method: putty. Squadron Green putty (yes, the sometimes dry, crumbly stuff) worked perfectly, even out-performing the Tamiya Gray creamy putty (which hardens too much).

I cut strips of masking tape by wiggling my hand slightly as I drew a sharp #11 blade along. This gave me an uneven edge. Two strips close together made excellent masks. I then smeared a heavy amount of putty on the mask, peeled off, and let dry. In fact, I waited months until the hull work was almost complete before continuing the weld seam process, because I figured a lot of handling would flake off the fragile putty. (The model is so big I continually whacked bow and stern against the wall and work lights.)

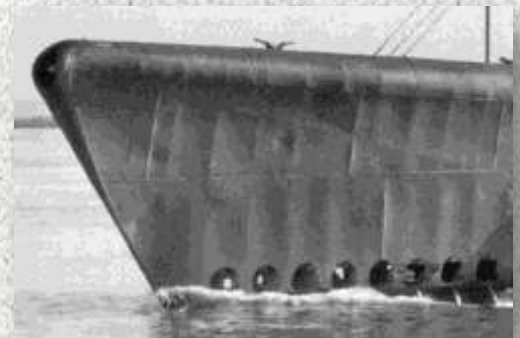
When ready, I sanded the putty seams very shallow, and used a variation of my knife technique to make them thick and thin in random patterns. In the end the seams are actually very durable, and hopefully natural looking. I cannot stress enough how fragile-sounding this seems, but how durable and easy it really is.

Several forum mates suggested alternate methods which are worth exploring: pre-cut styrene strips (or even stretched sprue) glued and then sanded/hacked; and also using a modelling syringe to apply a bead of white glue (Elmer's or Aquadhere). They both sound like good alternatives because the plastic would adhere well and be strong, and the syringe-applied glue would be fast and probably look great. I was already well into the putty, so I continued, and as mentioned the putty was easy to work with and surprisingly tough.

Oil canning - Boat hulls appear smooth from a distance, but up close, it is obvious that ribs or “frames” support the sheet metal skin. It is noticeable because the metal is slightly indented between ribs. This is called “oil canning”, presumably because thin oil cans indent and deform when squeezed.

This indentation happens naturally - there is much more support at the frames. Other factors turn up the intensity, like slight ripples to flat metal, unevenness, differing expansion and contraction between the free metal and the fixed metal, etc. Submarines add pressure from dives, and depth charging. Though the free-flood hull casing would not be affected by pressure (equal on both sides), all the other factors combine to make the ribs stand out even there.

I added an oil can effect to U 557 to make the finished model seem more like a real boat. I cut masking tape into thin strips and laid out panels, then scraped each panel into a slight bowl shape using a **very** sharp #10 curved X-acto blade. I went through about five blades per side, discarding them as soon as they went from “ultra-sharp” to “average sharp” (still sharp enough to use, just not for



Above right (H18): Oil canning on a Gato.

Right (H19): Replicating this effect on the Revell kit.

scraping). Then I finished with a light sand using flexible nail files. I added buckles and dents from minor collisions by scraping small but deeper lines and over-sanding them.

Rivets - The existing Revell rivets are a nice touch, though they may be a tad big in scale. With all this detailing, it is almost inevitable that some rivets may be lost. There are some replacement methods, though none are perfect.

There is a tool you can make from a nail, essentially just a very small hollow punch. Construction details are available at the inventor's website: <http://www.futchfactor.com>. I used this method for replacing some rivets on the main hull, where I had moved the anchor well. I used a drill press to drill a nail head, and then sharpened. It worked very well, but I had to make three and sharpen often to make nice crisp rivet heads. Some modellers have used commercial nail/craft punches – great if you can find a tiny one.

I replaced the entire hull casing above the long slot because the original piece was too thick and yet flimsy at the same time after cutting out the slot. By using very thin sheet styrene (.3mm / .010") as a replacement, I was able to get a little "sheet metal bend" over the ribs I added. It also allowed me to add new rivets by poking a scribe (any pointy object would work) on the back side. A little pin-prick on the back bulged out a nice little round rivet head on the front. This was large but very acceptable. Others have used micro beads, or drilled tiny holes and filled with tiny rod.

Stern

Stern torpedo tube - I rebuilt the stern torpedo door and the curved exit "tube", mostly because I didn't have confidence in the kit part and the way it was meant to go together. The accuracy of these simple pieces is not necessarily poor, but perhaps the kit engineering makes the job more difficult than needed.

Propellers - The pre-1942-ish propellers were bronze; due to material shortage steel was used later. U 557 was laid down in 1940, so most likely had bronze props. The kit plastic would not do, so I bought **Raboesch** brass props: 20mm (3/4" or .79") A-type, Left and Right. These are excellent quality - highly recommended for any naval project. The more exact scale would be 22mm, but is not made.

The appropriate Raboesch props are "snub hub", but research photos and the model showed the hubs as pointed. I used my bench top drill press as a vertical lathe (Dremel or hand drill in a vise would also do) and turned the snub-hubs to points. I thinned the blades to a fine edge for a scale look, and then weathered the props in hydrochloric acid, saltwater, vinegar, and finally fresh water (the local high-chlorine content fresh water worked best).

Part IV – The Deck

Replacement decks

The drainage slot pattern on the Revell deck is reasonably accurate. However, it is a little too simplified in certain areas, particularly around the 88mm and the tower. More noticeable are the slots themselves, which are too wide. Revell omitted the line of small circular holes that ran all the way along both edges of the deck. Removable deck railings were sometimes fitted into these holes, particularly during commissioning ceremonies.

The aftermarket sets to replace the Revell deck are:

Modelbrass deck – The slot pattern on this photo-etched brass set has been improved, particularly around the 88mm. The slots themselves are narrower, and are a great improvement over the Revell deck. The small circular holes along the edges are included. The piece for the deck area of the tower corrects the inaccurate UZO placement (discussed later).

Right (H20): A propeller converted to a snub-hub.



Nautilus deck – The slot pattern on the Nautilus wooden deck is the same as the Revell deck. The slot width has not been corrected, and the circular holes along the edges are missing. The tower deck piece does not correct the inaccurate UZO placement. For some modellers the disappointing lack of improvements will steer them towards the more accurate Modelbrass deck.

One point in the wooden Nautilus deck's favour is that it may prove easier to fit than the Modelbrass deck, or to modify. Also, Nautilus Models contend that a wooden model deck better represents the real wooden U-boat deck. The wooden areas of the U-boat decks were coated with a black wood preservative; as the preservative became worn, the wooden colour of the deck used to gradually appear. So the wooden deck may prove easier to weather realistically than a brass deck.

Eduard – The Eduard 53-008 PE set does not include a full deck but does include the steel sections at the bow and the stern. This PE set is quite thin so care needs to be taken when handling these two pieces. The best feature of these two pieces is that raised circles have been added on the surface of the metal to replicate the anti-slip tread surface present at the bow and stern. The circles are oversized but from a distance of anything over six inches they look okay – certainly better than the featureless sections of the Modelbrass, Nautilus and Revell deck sections. Also included in these two pieces are the circular drainage holes, some of which might have been used for removable deck railings. They are slightly too big, but again they are better than the alternative sets. I used the Eduard end pieces for U 557.

Fitting the deck

The reason I went with the Nautilus wooden deck is because it fits more solidly. I used a Dremel ball end mill to grind in pathways that would be worn down from walking the deck. This is of course scale exaggerated, but otherwise it wouldn't show, and I think the end effect works.

I then sanded and stained with two water-based stains - one brownish and one reddish. Both of these were combinations of stain plus sealer, which gave the deck a nice smoothness, but without being thick and shiny. The sealer helps stop any warping when paint is later applied, but I did not have any warping from the stain itself either. I "dressed the deck" with Eduard accessories: anti-slip treads for the 88mm, and hinges and hatch covers.

I wanted the deck to press fit in rather than be part of the structural integrity of the finished model: the original plastic deck is meant to help bring in the hull sides slightly and form into one glued unit. That's too much stress for the wood, so I added a couple of strips of plastic to hold the hull together at the correct width, taking all the stress. The deck dropped onto its shelf and was glued with gel CA. I puttied the edges with Tamiya creamy gray putty, hiding all seams between the pieces and the hull casing edge. The actual boats had a thin lip from the hull casing, but this is extremely difficult to depict in scale (the kit's thickness is too much, and too difficult to thin down without causing damage).

Other deck parts

88mm deck gun – The 88mm deck gun in the Revell kit is actually pretty accurate. As we would expect with an injection-moulded kit improvements can always be made.

Not included in the Revell kit gun is the combined elevation and traverse sight, which could be mounted either to the starboard or the port side of the gun. Nor is a lead sight included. Both these parts were detachable, and usually only seen when the gun was in use. Another omission is the lanyard wire which was wrapped around the barrel when not in use. The wire can easily and quickly be added to the Revell barrel.

When the gun was in use, the lanyard wire was wrapped around two small L-shaped hooks at the front of the base. As we would expect, due to their small size the hooks do not feature on the Revell kit.

Included in the CMK set 72004 are resin parts intended to improve the kit gun. Several original Revell kit parts are to be used in conjunction with the CMK resin parts. However, some of the CMK replacement parts do not improve over the Revell originals. Revell parts 96 and 97 (which lie in front of the breech) could arguably be improved, but improvements are not included in the CMK set. More disappointingly, no combined elevation and traverse sight is included, nor a lead sight. The breech housing is, though, an improvement on the Revell kit. The CMK barrel does have the lanyard wire wrapped around the barrel, and a well moulded waterproof tompon does feature in the gun's muzzle.

I used the kit shoulder pads but built new supports from brass wire. As U 557 was to be depicted in port, and therefore not in use, I reversed the supports by flipping them in toward the gun. I also used Steve Nuttall's machined brass barrel. (Note: Steve has since died and his business been sold. There are few if any manufacturers filling the void.)

Fairleads – If fitting a replacement deck, the small fairleads should be added. There was one near the bow, with two side by side farther back, plus one more next to the stern. Ropes were put through these fairleads when mooring the boat. There was also another small T-shaped fairlead under both of the forward deck railings, and one under both of the aft deck railings.

Bollards – Larger ropes were tied around the seven pairs of bollards which featured on Type VIICs. These bollards are depicted in their retracted position on the Revell kit but some or all of them were often extended when in port. Six of the pairs had a rectangular support around the base but the pair near the stern did not have this support. The tops of the bollards were not simply the circular shape in the Revell deck – the tops extended slightly at one side in a tear drop. The corrected bollard top shape is included in the Modelbrass set. However, the resin extended bollards in the CMK72004 set do not feature the correct bollard top shape. I scratch built my own, depicting a forward and aft pair extended. I used tubing and a tiny sliver of plastic to make the cross piece (the PE replacements are flat with no cavity).



Left (H21): New ammunition hatches were built and added to the Nautilus deck.

KDB – The T-shaped part on the forward deck (part 67) belonged to the *Kristalldrehbasisgerät* (KDB, crystal base instrument) underwater detection system. This system complemented the GHG system around the hydrophones; it was accurate but short in range. The T-shaped piece on the deck, with six hydrophones on the head, rotated. The Revell KDB part is reasonably accurate.

Capstan – Located aft of the KDB was the extendable/retractable capstan. The Revell piece (part 47) is reasonably accurate. However, improvements can be made, particularly in adding the two prongs which protruded from the top. Photos show that there were slight variations in the capstan design on VIICs. I painted mine silver and washed with rust to show wear and surface corrosion.

Triangular supports – Parts 68 and 69 are the triangular supports for the aft jumping wires. Note that on early VIICs the point at which the three legs merge should be above and between the two inboard legs. On the late VIICs the point was above the single outboard leg. Between these triangular supports is part 46, the aft navigation light. It is roughly accurate but slight improvements can be made.

Painting the deck

I painted the deck before starting on the tower or painting the hull. I used the White Ensign Models *Dunkelgrau 53* (dark charcoal) enamel as the black wood preservative, dabbing and blotching it on with an old brush (which was destroyed by the end). While the paint was still a bit wet I dabbed and blended in lighter grays around the edges of the worn bits, gradually getting to a very light colour in some spots, and leaving the stained wood in the very centre here and there. I added wear to the metal bits by dry brushing silver on the edges.

Final touches included adding matt black as oil/grease stains in high traffic areas and on hatch covers etc., then doing a little diluted gray washing and dry brushing to blend everything together. When thoroughly dry I passed a super fine flexible file ("ladies cloth nail file") over the paint to turn the harsh flatness into a smoother, more scale look.

Part V – The Tower

Outside tower

Tower type - The first step in building the tower is to choose whether the model will have a mast antenna housing (MAH, discussed in *Type VII Modifications*). As my chosen boat U 557 had no MAH, I had no need to fit this feature.

The next choice after the MAH is to choose which style of intake grill is to be fitted. It appeared from photos that the earliest *Blohm & Voss* boats up to and including U 556 had the slat grill. Photos also showed that U 558 and the boats which followed in the series all had the mesh grill. Unfortunately, with no available photos of U 557 at the time, it became impossible to determine with certainty which style this particular boat had. U 557 was the one boat we were unsure about in this respect!

To try to shed light on this matter, I studied the building details of the boats in this batch. I noticed that the launching dates were often the same for a pair of boats. For example, U 553 and U 554 were both launched on 7th November 1940, U 555 and U 556 were both launched on the 7th December, while U 557 and U 558 were launched on the 22nd and 23rd December 1940 respectively. The dates on which the keel was laid down were similarly in pairs. With no other information at my disposal, I proceeded under the supposition that U 557 was more likely to be similar to U 558 than U 556. As U 558 had the mesh grill, my U 557 model would too.

A few years later photos of U 557 did come to light. While it was interesting to see the real boat, they did unfortunately show that the real U 557 actually had the slat grill!

A very handy PE part for the mesh grill is included in the Warhammer and Eduard sets. On both PE pieces, a hole has correctly and commendably been included in the mesh. The removable commander's flagstaff – which was often seen on boats when in port – fitted into this hole in the mesh, either on the starboard side or the port side. The commissioning pennant, consisting of a narrow strip of white material, would often fly from the top of the flagstaff.



Above (H22): The deck was weathered before the painting of the tower. Note the top half of the tower has been replaced using the excellent resin example from Warhammer. Unfortunately the Warhammer set is now out of production.

Wind deflector flange - The wind deflector flange, fitted around the outside edge of the top of the tower on some boats, was discussed in *Type VII Modifications*. As my model depicted U 557 in October 1941, when this feature was usually present, I decided to fit it to my model. The Revell flange does curve towards the bottom, as was the case on the real boats. But one fault regarding the Revell example is that it is understandably too thick. In 1/72nd scale the flange should be much thinner, like the real boats. Fashioning a replacement may be desired by some, while others will be content to use the Revell piece. I thinned mine down, including the support ribs.

Markers - At the foot of the front of the tower is a fairing which incorporated the magnetic compass. On the Revell fairing is a rectangle with two squares at the top. This was the panel which allowed access to the magnetic compass. On this access panel was a marker consisting of a square shape with a cross inside; both the square and cross were in raised detail. This marker is missing from the Revell tower but can be found, along with a replacement access panel, on the Eduard, Modelbrass and Warhammer sets.

There were similar markers towards the rear of the tower, below the main tower railings. There were two markers on the starboard side, and two on the port side. One marker consisted of a square with a cross inside, while the other marker consisted of a circle with a cross inside. These markers are not featured on the Revell kit but can be found on the Eduard, Modelbrass and Warhammer sets. Both markers were in place in raised detail upon a rectangular shaped access panel. These access panels are not featured on the Revell kit but can be found on the Eduard and Warhammer sets. Above the access panel was a pair of small square free-flooding holes. These do feature on the Revell kit but should be drilled out.

I removed the access panel to show a crewman working on the compass inside. I thinned down the edges of the "compass boot" to give the illusion of scale thin metal, and used a PE hatch glued open. The compass itself was roughly a ball on a stick, so I scratch built a simple little compass and painted everything dark.

Radio aerial inlets - The spray deflector on VIICs was located halfway up the outside face of the tower. Just above the spray deflector is a hole offset to starboard. Inside this hole was the radio aerial inlet for the forward jumping wire. A thin wire extended from this inlet to the jumping wires (which served as a radio aerial) above. This inlet was an insulated conduit which prevented the wire from short circuiting on the metal conning tower. The aerial inlet is positioned to the starboard side of the hole on the Revell kit, though it was usually central on the real boats. The hole itself appears to be in the correct location on the kit.

There were similar aerial inlets for the two aft jumping wires. The majority of VIICs had two L-shaped connectors which ran parallel to the two vertical railing stanchions either side of the rearmost stanchion. The bottom of the connectors entered the tower beneath the rear of the tower floor, while a very thin wire ran from the top of the connectors to the jumping wires above. These connectors were insulated conduits which prevented the wires from short circuiting on the metal conning tower. There were slight variations in their style - some had a flat top, others a pointed top. These connectors are not included in the Revell kit, nor are they included in any resin aftermarket set, so they should be scratch built. I used styrene rod bent to shape, and drilled a tiny hole and inserted a small bit of wire.

Navigation lights - There were three navigation lights on the tower (and one more on the aft deck). The rear navigation light on the tower was located directly at the rear, just below the railings. As demonstrated in *Type VII Modifications*, there were several different styles of rear light. As the light on the Revell kit is entirely different to any of the styles featured on these boats, scratch building is required. I used the style which featured on U 552 and U 553 for my U 557 model.

Other outside tower details - Above the magnetic compass fairing are two holes offset to port. These appear to be roughly the correct size and position but should be drilled out. A foghorn was located in the

top hole, though this cannot be seen in photos. I moved mine slightly based on photos, drilled out and inserted tubing (large diameter for the foghorn) to match pictures. In addition I added the point of a round toothpick to be the horn.

Parts 51 are the two lifebelts. They were sometimes seen on the sides of the tower when the boat was in port, but quite often they were not. When the lifebelt was missing, the pieces which allowed the lifebelt to be attached to the tower still remained. This consisted of egg-cup shaped holders at the bottom, with a clip at the top. The egg-cup shaped holders can be fashioned from the Revell lifebelts while the top clip is included as part 51 in the Eduard set.

On the sides of the tower, just below the front of the tower floor, are a pattern of small round free-flooding holes. The pattern is not correct for VIICs so pieces were included in the U-Brass set to better represent this area. As expected the pattern of holes varied between VIICs. The U-Brass parts replicate the pattern that featured on U 201.

Eduard offer replacement parts for all the panels which could open up on a VIIC tower. The only tangible benefit of fitting these parts is that the hinges are better represented.

Inside tower

20mm gun - The 20mm gun in the Revell kit is actually pretty decent, though slight improvements can be made. I used another Steve Nuttall machined brass barrel. The Warhammer (part 24) set and White Ensign's WEM7203 set both provide very useful PE parts to replicate the removable gun sight on the 20mm.

Note also that there was a lip along the edge of the rear circular area of tower floor; this can easily be replicated with thin plastic rod. I used flexible lead wire and stuck it down with CA.

Attack periscope base - Moving forward, we come to the attack periscope and its base below. The attack periscope included in the kit is, towards the top, too wide. Superior replacements are thankfully available: CMK7204 includes an excellent metal attack periscope while Warhammer's replacement is in resin. Type VIICs had anti-vibration wires which wound around the head of the attack periscope. A PE piece which helps enormously in replicating these wires is included in White Ensign's WEM72003 PE set.

As covered in *Type VII Modifications*, there were some differences in the railing bars that featured on attack periscope bases. The base for the attack periscope that is provided in the Revell kit is unquestionably poor. It is devoid of the little features which were present on this part. Rather than featuring bars, there are two steps which run around the base. But far more of a concern is the incorrect height of the attack periscope base itself: the real base came up to the same level as the top of the tower bulwark. Revell's piece is notably too low in height.

We have two resin replacements, from CMK and Warhammer. The Warhammer piece is superior in terms of detail (it includes the bolt heads on the base) BUT the Warhammer base is the same height as the Revell base. Oops! Of course, the inaccurate height renders the Warhammer base useless. Thankfully the resin base in the CMK 7204 set is the correct height, and thus makes it the only choice.

The CMK piece does require some holes to be drilled. Once that



Above (H23): An entirely new attack periscope base was built; this included railing bars that are evidenced on *Blohm & Voss* boats in the U 55X series.

is done, the railing bars and grips should be added. The bars may have been around 1" in diameter or so, perhaps a little less.

I chose to scratch build an attack periscope base. I used tubing and rod turned to shape on my little home drill press, used as a poor man's vertical lathe (minus proper tool rest!). As I planned a dockside scene, the scope itself would be retracted. I used the kit scope and placed it inside tubing down the centre of the base, so that looking down some slight gap and head detail can be seen. For rails and handles I used brass rod.

Next the magnetic compass repeater should be added. The repeater was located to the front of the attack periscope base, at a level which is just above the top of the base. A resin magnetic compass repeater is included in both the CMK 7204 and Warhammer sets. There is still a lot of scratch building to be done to accurately replicate the parts around the repeater, and the supports which held this in place on the attack periscope base. The black rubber cable which ran from the underside of the repeater to the attack periscope base should also be added. There were also two small steps on the front side of the base, one on either side.

Tower hatch - For the tower hatch, I used plastic tubing to form the hatch ring. I also built a tower pressure hull so that the wood deck would sit on top, with gaps around the hatch, as in photos. An area which is not often discussed is the latch for the tower hatch. The latch was in place at the front of the attack periscope base, and held the hatch in the open position. It is not included in any aftermarket set and needs to be scratch built.

Right (H24): A rebuilt tower hatch.

Below right (H25): A work in progress shot of the scratch built UZO.



UZO - Ahead of the hatch was the *Uberswasserzieloptik*. Being a bit of a mouthful we usually just refer to it as the "UZO". This column was used to aim torpedoes during surface attacks. Although VIIC photos indicate that the column was positioned directly in the centre, Revell has placed the UZO offset to port. Some readers may recall the offset UZO was a major talking point on internet forums upon the kit's release. One photo of a Type IX does show a column offset to port. Revell's designers may have seen a similar photo and, not realising they were viewing a Type IX, mistakenly concluded that VIICs had offset UZOs. Well, whatever the cause, it needs moved to the centre.

The Modelbrass and Nautilus sets both include replacement tower decks. The Modelbrass part has the UZO position in the centre, with the square shaped holes in the tower floor suitably repositioned to allow for a central column. The Nautilus part is, like their deck, copied directly from the Revell kit. The Nautilus piece therefore has the UZO in the incorrect position offset to port.

There are resin replacements in the CMK7204 and Warhammer sets for the Revell UZO column. Below the azimuth ring on the UZOs, there was a thick section about a foot in height. Below this thick section, the UZO column became markedly thinner in width. On the CMK UZO, the top thick section is not represented, nor is the thinner lower section. This makes the usefulness of the CMK UZO questionable. Thankfully, though, the Warhammer is a worthy replacement. The top thicker section and thinner lower section are accurately represented, and the top half is also more accurate than the CMK part.



Both sets include accurate versions of the binoculars which sat on top of the UZO. These binoculars (and the binocular mount underneath) were usually kept inside the boat, and brought out only when required. As U 557 is depicted in port under small overhaul, I did not fit the binoculars or the binocular mount underneath.

A horizontal bar ran around the UZO (at the bottom of the thicker section). Another vertical bar was in place at the rear of the column. This was gripped by crew members when they climbed up and down from the tower hatch. Both these bars need to be added. There was also a wide rim which went around the column, only a few inches from the tower floor.

The tower floor behind the UZO was made of wood, with square shaped drainage holes. However, the small area of floor ahead of the UZO appears to be metal. There were no square shaped holes in this metal area, so the holes in the Revell kit (and the Modelbrass and Nautilus tower decks also) should be filled in. There is a dearth of photographic material regarding the tower floor so there may have been variations and exceptions to the norm.

The main piece in the Warhammer set - the top half of the tower – extends to this area ahead of the UZO. This area is correct in the Warhammer set, with none of the square shaped holes that feature in the other sets.

[Sky periscope base](#) - Forward of the UZO was the sky periscope, and its base below. As with the attack periscope, the example in the Revell kit is, towards the top, too wide. Superior replacements are thankfully available again in the form of the excellent metal attack periscope in the CMK 7204 set, and Warhammer's resin replacement. The anti-vibration wires which wound around the head of the attack periscope did not feature on the sky periscope.

The base for the sky periscope was a cylindrical column. Better examples are included in the Warhammer and CMK7204 sets. The Warhammer instructions indicate that two vertical grip bars should be added to the base, towards the top. Sometimes a lid (with a handle) could be seen directly on top of the sky periscope base and the attack periscope base. No aftermarket sets include lids. Should this feature be desired, the lids can be scratch built with relative ease.

[Inside the tower bulwarks](#) - The main piece in the Warhammer set replaces the top half of the Revell tower. This Warhammer part is vastly superior, and highly recommended. Comparisons between the inside of the tower bulwark on the Warhammer and Revell examples show that the Revell kit is quite inaccurate in several respects. One main inaccuracy is the shelf that is in place above the tower floor on the Revell tower. This shelf extends all around the inside of the Revell tower, from one air trunk all the way to the other. Photos which show this area are few and far between but the continuous shelf appears to be inaccurate. Rather there were two short steps - one on either side in front of the air trunks. The main Warhammer includes two PE parts for these two metal steps, with a criss-cross anti-slip pattern on the top surfaces.

The front area of the inside of the tower - sometimes referred to as the "dashboard" – is very different in the Warhammer set than the Revell kit. Photos showing this area are very rare, so most of us are unsure about all the details in this area. But the photos do indicate that the Warhammer piece is reasonably accurate, and vastly superior to the Revell kit. There are two voice pipes low down on the Revell kit but they are not visible in this position in available photos.

What is evident in the photos is a circular repeater dial on the left hand side, with a compass repeater above. At the top of the right hand side was a voice pipe, which sat on a small shelf. The Warhammer set includes the circular repeater dial, the compass repeater, and the shelf, while the voice pipe can be fashioned from one of the two Revell voice pipes.

The circular coping along the top of the bulwark is accurately depicted in the Warhammer piece. Note, though, that some very early boats (such as U 69, U 94 and U 96) did not have this coping all the way round the tower edge – the coping only featured at the front of the bulwark edge.

The Warhammer piece also includes the small holes just below the coping, plus the small hooks which were present within the holes. Lookouts could tie their safety harnesses into these hooks, preventing them from being washed away by nasty waves. There wasn't as much depth or detail as I wanted, so I cut open a standard



Left (H26): U 557's tower benefitted from Warhammer's resin piece for the top half of the tower. Note the slight lip around the circular area at the rear of the tower.

electrical lamp cord and extracted a single strand of copper wire, then cut this to tiny strips to represent the hooks. I used CA to put them in place, trying to keep them just a fraction of a fraction larger than the diameter of the hole/well, rather than have them much longer and anchor over the edges. When painting I added darker dirt stains and paint chips.

At the front of the bulwark, there were several metal strips - "L" angle stiffeners of some kind - which ran from the coping downwards for around a foot in length. These are accurately and commendably replicated in the Warhammer piece. When all these factors are considered, the Warhammer piece rates as first class.

Wooden strips - Unfortunately for the lookouts, the series of vertical strips running around the tower bulwark were not heaters to warm their hands (as some commentators have suggested!). Rather they were wooden strips which prevented the lookouts from sticking to the bulwark sides in icy conditions. The PE replacements in the Eduard set include the dots at the top, middle and bottom of the strips. Other than these dots the strips are well represented in the Revell tower.

Over time more wooden strips were added to VIIC towers. One area they were added was the walls of the air trunks. Suitable PE parts are helpfully included in the Eduard set for depicting wooden strips on the air trunks. The wooden strips were also added over time to the sky periscope base, UZO and the attack periscope base.

Foldable seats - One feature that is missing from either side of the tower bulwarks on the Revell kit (and the Warhammer piece) are the foldable seats. Square in shape, with rounded edges, they usually folded flat along the tower walls. However, they could be extended into a horizontal position, with a bar below to hold them up. On U 564 there were two such foldable seats on the starboard side, while U 552 had two foldable seats on the port side. These foldable seats were located above the steps, in the area where the wooden strips were present.

On the port side of the inside tower bulwark on U 564, there was the raised detail of a circle with a cross inside; this was located just above the port step. Many other boats may also have had this feature.

Railings

The main set of railings around the rear of Revell tower are all moulded in the same thickness. However, the real VIIC railings varied in width. There does not appear to be any documentation in common circulation that specifies the thicknesses of the railing bars. Without this we are forced to guess. One method is to gauge how thick the bars were in relation to crewmembers' hands. There is some variation between men's hand sizes but not overly so. Also quite handy is the fact that men's hands were apparently the same size in the 40s as they are now.

The top horizontal bar is notably thicker, somewhere in the region of 2" / 50mm in diameter (.030" / 0.7mm in 1/72nd). The middle horizontal bar is far thinner, perhaps 1" / 25mm in diameter (.015" / 0.35mm in 1/72nd). As for the vertical stanchions, the third stanchion from the front was noticeably thicker at 2" / 50mm. The other verticals were all 1" in diameter or so.

Some modellers may prefer to rebuild these main railings. Others may be content to leave them as they are due to the difficulties involved in the task. I chose to make new railings. The brass rod available was slightly smaller and slightly larger in diameter than the perfect scale choice, so I went a tad small to help with the scale thin illusion.

I built a simple round jig out of wood. This was just a small disk the diameter of the top rail, and I bent brass wire to that. I had planned to build a cone-like jig to put on the rest of the pieces, but I thought it was too much trouble. This was a huge mistake! For me, the entire soldering process was extremely unpleasant and I had to make three sets to get it right. But it could have been smoother and more pleasant had I just built the jig! So my advice is to not be scared off by soldering and just be patient and follow some simple guidelines.

Modeller Gabriel Benzur went to the trouble of building a cone jig and he has made a very well-built rail. He and others also put a lot of preparation into soldering and it pays off: lightly sand the brass, and if possible, wash with lacquer thinner, and use flux. There are good tips on soldering on many modelling forums and I strongly recommend reading tips and giving it a try. The thin, scale-looking rails are far superior to chunky plastic.

The grips or grab handles on the Revell tower walls are simply shaped as a C (when looking vertically down upon them). However, on the real boats the horizontal surface of the grips on the tower sides were bent downwards like standard grab handles many readers are familiar with. I used needle-nosed pliers and made my own. This was very quick and easy even though I have never made grab handles before.

On the Eduard PE set there are a number of small pieces numbered 29; these can be used at the points where the railings entered the tower, behind the railings themselves. These have some value but are not essential, as they are flat PE and not round rod.

For those modellers who are fitting a MAH, there are a few points to consider regarding the railings at the side of the tower. The MAH on the Revell kit has a railing on either side, both of which

enter very close to the edges of the MAH. The railings actually entered the MAH closer towards the middle. However, on some boats such as U 82, U 132 and U 253, rather than two separate railings there was one long one which went around the MAH.

Some boats (such as U 253



Left (H27): The rebuilt wintergarten railings can be seen, as can the open access panel on the magnetic compass fairing at the front of the tower.

and U 441) had two extra vertical railing bars just behind the MAH (plus two others in the same location on the starboard side). Crew members could grip these bars when climbing from the deck to the tower, allowing them easier access to the tower.

One feature which should be addressed is the absence of the four L-shaped grips (two per side) at the rear edge of the tower bulwark. The top grips were located between the bulwark edge and the top horizontal bar, while the bottom grips were located between the bulwark edge and the tower floor. These appear to have been around 1" / 25mm in diameter or so.

Most boats also had a fairlead at the trailing edge of the tower bulwark (near the top); this small piece is included in the Warhammer set. Some other boats, such as U 201, did not have a fairlead here. Instead they had a series of very small hooks along the trailing edge of the bulwark.

Part VI – Painting & Weathering

White Ensign Models (WEM) makes a range of well-researched and crafted Colourcoat paints. I bought a sample tinlet of the colours I would need and mixed my own match out of several Humbrol colours. I came very close and was quite pleased with the match, but I highly recommend just buying the WEM paints. I mixed because I wanted a challenge, and I was afraid I would run out of WEM paint halfway through painting. I ended up using the WEM as a topcoat.

I wanted the paint as thin as possible, so I used the above-the-waterline colour (*Dunkelgrau 51*, a medium gray with some blue) as a primer for the whole boat, and then just added a thin top coat. I used an airbrush (trusty single-action Paasche with craft small compressor and a water trap).



Above (H28): Staining can be found around the diesel exhaust outlet

I masked the waterline with Tamiya super-special, low-tack (but clean edge!) masking tape, and then painted *Schiffsbodenfarbe III Grau* below the waterline. This is a dark charcoal gray, almost black but with a slight blueness. I hand-brushed the hull – yes, hand brushed. It's a much larger area than the tower and above-waterline hull, so why-oh-why would I risk brush marks? I hand brushed because I would be weathering and "distressing" the hull so much that it would be pointless to spray. Another reason is that I could use any brush marks to my advantage by making every stroke top-to-bottom downward, thus helping to simulate metal grain and water drain stains. I thinned the paint a tad more than normal, and it went fast and easy, with the desired effect.

Then I went back over everything, darkening the oil-canning in spots, and lightening the ribs. I altered the colour mix with lighter and darker combos, and sometimes more flat paint added to the matt, so the end result is salt-faded (and above in light gray, sun faded/oxidised) patches. The final touch was paint chipping. I just used white-ish gray on the hull, and white and even dark, medium gray on the upper works.

For the application of rust I began by using an almost fluorescent orange, then going over with a wash of a super-flat rusty brown and dry brushing in another brown-red. I used photos for rust spot locations. The final touch was faded paint from wind and salt-water pounding.

Photos and period accounts were used as weathering sources. I added grease and dirt smudges and paint chips wherever grubby little humans would go! I didn't want to overdo the weathering, but I did not want a pristine showroom boat either.

For effects I dry-brushed and did almost no washing; I didn't use pastels, and did NOT seal with Future. I read about the technique, was very excited about learning (and even went to great trouble to track down the Australian equivalent), but in the end I didn't want to add a thick layer and then dull coat on top of that. The model will be displayed in a glass case so I'm not worried about dust.

Part VII – Decals

Düsseldorf town crest

Dozens of U-boats were sponsored by German cities. When a boat was sponsored, the coat of arms belonging to the city would often be used as the boat's emblem. Many of these coats of arms can be found in *U-Boat Emblems of World War II 1939-1945* by Georg Högel, the definitive work on U-boat emblems. The book relates that U 557's sponsor city was Düsseldorf, and includes the coat of arms that would have been present on the tower of the boat.

To accurately depict the coat of arms, I drew the design and then had a decal maker strike the crest from my art. I applied the crest at the front of the tower, above the spray deflector, this being the most common position. On top of the decal I added fading and chips and rust. Here I did use Future as a base, and as a sealer, along with decal set and some dull coat.

Right: The Düsseldorf town crest.



Waterline draft markings

Type VIICs had six sets of white waterline indicator markings. Each set consists of white numbers and marking indicating how high or low the boat sat in the water at various loads and trims. There were three per side: one on the bow, one amidships on the saddle tank, and one at the stern.

Although the numbers are small, they do stand out on photos of U-boat hulls, particularly freshly painted boats. As a result, I definitely needed a set of decals to depict these markings. Unfortunately suitable decals were not available in the Revell kit or from aftermarket companies. Rather than wait around to see if anyone would produce a set, Dougie and I decided to produce our own. We designed them in CorelDraw and sent this design to a decal maker to be printed off. However, when Dougie tested this first production run he found that the numbers disappeared, having reacted with the overlying varnish. Very annoying!

Rather than being disappointed again, we decided to get the next set printed at a professional decal printer company. Although the set up costs would be higher, we needed to have high quality product. Dougie found a local decal company in Scotland – *Macdou Transfers Ltd.* – who provided a professional service and high quality result. Having been disappointed in the past, we were rather relieved to find during the testing process that the decals were fully functional: they were very thin, did not silver, adhered well...and did not react with varnishes!

Having kept a few sets for ourselves and our modelling buddies, we gave the rest of the waterline decals away as a bonus with each U-Brass set. It was the set of decals from the first Macdou production run that I used on my model.

Left: The waterline draft marking decals are available in 1/72nd scale and 1/144th scale from Accurate Model Parts.



Some of our modelling buddies, having used a set on their first U-boat model, wanted more sets. They felt that the decals were a very nice finishing touch to their model. Unfortunately there were no waterline decals left. We then decided to proceed with a second production run, this being one of the first Accurate Model Parts products.

Having been very happy with our first run, we used Macdou Transfers once again for our second production run. This time we opted for a higher number of sheets, and included waterline decals in both 1/72nd and 1/144th scales. We also incorporated snorting bull emblems in 1/35th, 1/72nd and 1/144th scale in our designed sheet. As the size varied on boats, we designed two sizes of bull per scale.

The decals are now available from AMP at <http://amp.rokkt.biz/decals.shtml>

Part VIII – Finishing Touches

Kriegsmarine flag

The Revell Kriegsmarine flag is paper with an empty white circle, missing the swastika (Germany outlawed the symbol). I am no fan of the Third Reich to say it mildly, but being an historic model, I think it is important to have a proper and accurate flag. Even putting in a Maltese cross would be a big improvement.

I bought commercial replacement scale flags to test. One was printed on fine cotton, another on silk. While both are adequate, neither was special. They were printed on cloth designed to run through an inkjet printer – this combination for production has many limitations and makes the detail chunky.

So I researched the Kriegsmarine flag and found photos of two flags with sizes stamped on the hoist. Having two historic sizes, I started the electronic art. I work for a digital printer and used the fabric heat press to transfer the images to very fine cotton. The image is pressed into the threads, rather than inkjet which alternates between absorbing in too much and just laying on the surface. The test went very well. I had a miniature cloth flag with **VERY** crisp detail. An added advantage to the heat press method is durability. Another key advantage over other model flags is that the edges do not fray.

I crunched up a prototype to give it an “almost no breeze” hang of straight folds, and glued it to the flagstaff. I wish I could have done it with a halyard, but it was a bit small for my skill - maybe next time. I think the end result is very natural, and the swastika is only partially visible between the hanging folds.

Having been delighted with the result, I began researching the viability of producing my own flags. This became possible through the formation of AMP. We now offer the modeller a variety of fabric flag designs in various sizes at <http://amp.rokkt.biz/flags.shtml>

Rigging

I had investigated model train latex string, EZ-Line, but in the end I used a combination of wire and thread. For the cable stretched between the handrails I used copper wire (ripped open a multi-strand lamp cord for very thin wire). All the thread I found had fine hairy bits, so I bought beeswax (from a farm/craft show) to rub over the line. I eventually found some very thin cotton that was hairless, and this



Above (H29): The U 557 flag was one of the prototypes for the range of flags now available from Accurate Model Parts.

turned out to be clean and easy to use. I tied single knots and used a drop of CA, to hold medium tension. Any contraction should not damage anything and any expansion should not hang slack.

I used U-Brass tensioners, and made my own insulators (two rounded bits of half-round strip, glued to either side). Then I painted with thinned paint so it would absorb into the thread without going gluggy and thick. Lastly I touched up with lighter paint for sun-fade and darker for dirt and grease.

Deck activity

Rather than display a lifeless static model, I added some deck activity. This included crewman at a winch loading a torpedo (CMK resin kit), crewmen loading supplies through the galley hatch (CMK),



and a few figures from the Revell styrene set of 50. These are not the same quality as the CMK resin, but detail is good. Most of the poses needed some chopping and changing. The styrene is blue and slippery and a little bendy, but workable once you wash it well and use CA. I put some coils of rope on the deck, big and thick coils and smaller pieces, to add to an overall busy and messy look as indicated in photos.

Above (H30): Figures and deck activity were added to bring the model to life.

Completed at last

Finally, after twenty-nine months of researching and building, my U 557 model was complete. More details and photos of my build (including a pdf on the patrol history of U 557) can be found at <http://www.rokkt.biz/models/modelsweb/rokkt/index.shtml>

The build was quite a journey for me, and took me in unexpected directions. For example, I ended up researching and writing about U 557's patrol history and this build article. Most notably, my U 557 model was the catalyst for U-Brass and my association with Dougie. In time this partnership would continue as Accurate Model Parts.

My build project allowed me to learn many new techniques that I had been afraid to try previously. About the only thing I would do differently is to make a "Battle Plan" to keep the project running smoothly and efficiently. For my Gato I will outline all the modifications I plan to make, and then organise them into best construction order, materials, sub assembly research, etc.

Though I spent the equivalent of a small country's annual naval budget and the project took longer than expected, it was very rewarding. I have learned much, made friends with similar minded enthusiasts around the world, and had a boatload of fun.

On next page (H31): U 557 was depicted with crewmen loading torpedoes through a deck hatch.



Revell Type VIIC Checklist

The following checklist is for Revell's 1/72nd Type VIIC U-boat (RV5015) model kit. This lists the main areas that are altered by modellers of this kit. Please refer to the accompanying articles in this collection for assistance on individual points.

Hull (from bow to stern)

- Add S-Gerät bow piece if necessary (see pages 86 and 144)
- Add small triangular piece (if desired) to stem
- Correct 2/3 holes next to stem (see page 59)
- Correct torpedo door length and surrounding vents (see pages 58 and 144)
- Correct 12 circular vents above torpedo doors (see pages 61 and 144)
- Move anchor recess forward (see page 145)
- Add rim around sections of anchor recess
- Re-do doublers up to rear end of torpedo doors
- Remove doublers under anchor recess (starboard side only)
- Move forward UT plates slightly farther aft
- For some boats, add GHG plates in different locations (see page 146)
- Add tensioner wire from forward dive planes to pressure hull (see page 92)
- Add plate on top of forward dive planes
- Correct group of vents behind forward dive planes. The Modelbrass set includes brass pieces that are the correct pattern but are slightly too "high" in height (see page 92)
- Add two doublers that run from the lower hull casing to the group of vents behind forward dive planes (see page 92). Small doublers should also run through between the group of vents (this is troublesome due to the inaccurate height of the Modelbrass piece)
- Add new dive tank inlet doors (above keel bar)
- Move the two "bumps" higher and farther aft (see page 146)
- Correct the pattern of forward main group of vents as necessary (see pages 52 and 53)
- Drill out all vent holes in hull (see page 146)
- The seam between pressure hull and hull casing is the correct width. However, a seam should be added beneath the forward end of the saddle tanks; a similar seam should be added beneath the aft end of the saddle tanks (see page 149)
- If desired, alter front of saddle tanks to snub nose (see page 148)
- Correct the length of central drainage area (shorten on starboard, extend on port side) (pages 63 - 66)
- Correct curved line of holes (if not fitting breakwaters) (see pages 60 and 61)
- Add ribs within central drainage area (see pages 63 and 147)
- Add two supports per side within central drainage area (see pages 63 and 147)
- Sand down the weld seams on the pressure hull to a more prototypical size
- Add manhole inspection covers on top of saddle tank (five per side)
- Correct medium sized vents above saddle tanks if necessary (see pages 56 - 58)

- Drill three elongated vents at the rear of the saddle tanks (see page 62)
- Correct the pattern of rear main group of vents, including exhaust outlet (see page 52)
- Correct vent holes around rear dive planes using Modelbrass piece (see page 62)
- Add sacrificial anodes on propeller shaft bracket (two per bracket) (see page 62)
- Add plate around the area where the propeller shaft bracket meets hull
- Add horizontal bar on rudder support (part 37)
- Replace lost rivets as necessary
- Add waterline draft marking decals

Deck (from bow to stern)

- Improve bull nose at front of deck (where tow rope passes through); the bow nose should be farther forward than on the kit (see page 144)
- If net cutter is depicted, move slightly forward
- If net cutter is not depicted, but had previously been present on the chosen boat, add the five supports that were in place when net cutter had been in place (see page 81)
- Add replacement deck; if necessary drill out circular holes along edge of deck
- Add metal sections at bow and stern, with bumps depicting the anti-slip surface
- Add metal tower hatches with hinges
- Improve hinges on wooden deck hatches
- Add small lip along edge of deck if possible
- Add very small lip along edge of breakwaters; also add very small holes which ran along the breakwaters just inboard of this lip
- Add wooden strips near edges of deck
- Improve top plate at top of bollards; add rectangular plate at the foot of bollards
- Improve capstan, adding prongs out of top
- Add anti-slip strips around capstan
- Improve KDB
- Improve brackets that held the deck poles in place
- Replace deck railings with brass rod that is thinner than plastic supplied. Modify railing bar arrangement as necessary (see page 90)
- Add wires (and turnbuckles) between forward deck railings and aft deck railings (see page 90)
- Add semi-circular air identification plate if desired
- 88mm gun can be detailed, with tompion, lanyard and other items
- Add anti-slip strips around 88mm
- Add small fairleads as necessary
- On jumping wires add the following –
 - Tensioners at either end of insulator block sections
 - Add turnbuckles
 - Improve insulators if possible
 - Add the splitter on the forward jumping wires

Inside tower

- Completely rebuild “dashboard” area, with engine repeater dial on left (see top right image on page 76)
- On the top shelf, add a magnetic compass repeater on the left and a voicetube on the right
- Around the top of the inside of the tower bulwark, add five vertical strengthening strips. A piece should also be added in the centre; two thin wires separate out from this piece and extend to the forward jumping wires (see leftmost image on page 84)

Revell Type VIIC Checklist

- For a very early VIIC add the mobile voicepipe apparatus (see page 84)
- Add step just above the tower floor on the starboard side (behind “dashboard”)
- Add coping around inside edge of bulwark (see pages 84 and 85)
- Drill holes around edges of the bulwark; add very thin semi-circular brass bars that were in place around these holes (crewmen would attach their safety harnesses here) (see pages 85 and 159)
- Do not fit part 77, which has a shelf that extends around the inside of the bulwark. Instead, add individual steps on either side of the inside bulwark (see page 76)
- Add square shaped retractable seats on bulwark (on some boats there were two on the port bulwark and one on the starboard bulwark; on some boats there was an additional one just forward of the D/F loop housing)
- Add circular marker (circle with a cross within) if desired to port bulwark
- Add correct mesh grill, with hole for commander’s flagstaff (see page 79)
- Improve base of MAH antenna if necessary (see page 80)
- Add commander’s flagstaff and commissioning pennant (see page 125)
- On some boats there was a metal holder at the foot of the port air trunk
- Replace sky periscope base and sky periscope; add lid to the top of the sky periscope base if desired
- Replace UZO; add a lip all the way around the UZO near to the base; add vertical stanchions (see page 157)
- If desired, add binoculars and binocular support to top of UZO
- Improve tower hatch; if open add ladder down to control section (see page 157)
- Replace attack periscope base, which is too short in height on the Revell kit (see pages 88 and 156). Add the following to the base –
 - Drill holes of various sizes
 - T-shaped bar if necessary (this was situated inside the large hole near the base on boats such as U 552)
 - Brass rod for the bar around base
 - Brass rod for the rungs on the side
 - Brass rod for the grip around top
 - Wooden strips if necessary
 - Two small steps that were in place on the front end
 - Magnetic compass repeater and support
 - Wire from the foot of the magnetic compass repeater to the attack periscope base
 - Lid if necessary
 - Latch which held the tower hatch in vertical position
- Add accurate attack periscope if desired. The anti-vibration wires should be added (see page 74)
- Add machine guns to top of bulwark if necessary
- As desired, add vertical wooden strips to the inside of the bulwark, both periscope bases and UZO; there should be hole near the top and bottom of each strip

Outside tower

- Add new thinner spray deflector with slight curve along bottom edge
- Add marker to fairing at front of the tower (see second image on page 113)
- Improve forward radio aerial inlet (see page 85)
- Add very thin wire from forward radio aerial inlet to jumping wire above
- Reposition and redo forward radio aerial inlet (U 93 to U 98 only) (see page 85)
- Drill foghorn hole and hole below (both are located near the front of the tower, just below the spray deflector)
- Improve brackets that held the jumping wires to the top of the tower

Revell Type VIIC Checklist

- Improve side tower lights (see page 87)
- Add markers on tower sides
- Correct vent holes on tower sides using U-Brass piece
- Correct slat grill and add lip below (see page 79)
- Add L-shaped connectors (conduits for rear radio aerial) at rear of tower (see page 86)
- Add thin wires from top of L-shaped bars to the rear jumping wires
- Add wires from tower railings to rear jumping wires
- Add extra wires on port rear jumping wire (U 93 to U 98 only) (see page 86)
- Improve rear tower light (see page 87)
- Replace plastic side tower railings with thinner brass; the horizontal rung should be bent to the correct shape; add plates behind where the railings entered tower
- If fitting MAH, care should be taken with location of tower railings around MAH (see page 160)
- There were two semi-circular horizontal plates (with a rectangular plate behind) on the side of the MAH; the port jumping wire passed through these plates
- If fitting the lifebelts, add the thin wires behind lifebelt
- If not fitting the lifebelts, add the top bracket and two cup shaped holders below
- Extra vertical tower railings may be required in the area where crewmen climbed up tower
- Add two L-shaped railing bars (on rear edge of tower bulwark) on each side
- Replace main tower railings, taking care to add correct size of brass rod; one vertical stanchion and the top horizontal bar should be a thicker diameter than the rest (see page 159 for sizes)
- The six wooden tower seats should be added on top of the middle horizontal bar. Note that the *Germaniawerft* boats had two longer wooden seats rather than six individual seats
- Add piece to the top of the top horizontal bar; this piece had two holes and was located next to the join between the railings and bulwark
- Add lip around edge of “wintergarten” floor (see page 159)

Appendix: References

Kriegsmarine U-Boat Colours & Markings

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Type VII U-Boat Modifications

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U 96 & The Laughing Sawfish

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Appendix: Photo Sources

The photographs included in the articles can be found in the books listed in this appendix. Following each book title are the codes attributed to each book. The codes can be found on the caption associated with each photo. The letter corresponds with the article, while the number is for each photo within the article. The page number of the book is also included for each photo.

- A Kriegsmarine U-Boat Colours & Markings
- B Type VIIC Free-Flooding Vent Patterns
- C Type VII U-Boat Modifications
- D The Snorting Bull Insignia
- E U 96 & The Laughing Sawfish
- F German U-Boat Victory Pennants
- G U-Boat Model Kits & Accessories
- H Super-detailing Revell's 1/72nd Type VIIC U-Boat
- I Revell Type VIIC Checklist

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⊕ C10a:P19, C17a:P88, C18a:P50, D5f:P19, D14b:P16.

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Appendix: Photo Sources

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⊕ A5 (courtesy of Hans Mair).

<http://www.u47.org>

⊕ F9.

<http://www.u552.de>

⊕ B1c, C10c, C15b.

Wink Gris 

⊕ F16, H1, H3-H7, H9-H17, H19-31.

Dougie Martindale

⊕ B7, B9, H2.

All drawings in *Super-detailing Revell's 1/72nd Type VIIC U-Boat* by Wink Gris 

All drawings in other articles by Dougie Martindale

Appendix: Recommended Reading

While this collection offers information, the photographs contained in this downloadable file have, by necessity and design, been limited in quality. The modeller should seek to acquire as many additional quality images as they can within their own budgetary constraints.

When modellers begin to study VIICs, they often struggle to identify which books will offer the best photographic content. In order to assist, I have listed the books which offer **photographs of specific interest to the VIIC modeller**. These are not necessarily the best books for general information of U-boats; rather they contain photographs of features discussed in previous articles. I have grouped these books into the following categories: essential; very highly recommended; highly recommended; recommended; and useful. When choosing the category for each book, I have taken the cost of these books into consideration. The allocation of books to groups, and the accompanying comments, have been made according to my own personal opinion.

Essential

Ground Power Special Issue June 1997: *German U-Boat of WWII (2)*. Delta Publishing Co. Ltd, 1996.

- ⊕ Very rare Japanese pictorial featuring numerous early VIIC photos in exceptional quality. May be found on auction sites.

Köhl, Fritz and Niestle, Axel. *Vom Original zum Modell: Uboottyp VIIC*. Bernard & Graefe Verlag, 1997.

- ⊕ Features photos of early to late VIICs and VIIC/41s. Each photo is of benefit to the modeller. Includes plans at rear.

Rössler, Eberhard. *Die deutschen U-Boote und ihre Werften*. Bernard & Graefe Verlag, 1990.

- ⊕ Numerous photos of VIICs being built or launched. Particularly useful for free-flooding vent patterns.

Showell, Jak P. Mallmann. *U-Boats In Camera*. Sutton Publishing, 1999.

- ⊕ Carefully chosen photos illustrating VIIC features. Includes very useful captions.

Stern, Robert C.. *Type VII U-Boats*. Brockhampton Press, 1998.

- ⊕ An essential guide to the characteristics of the VIIC. Features photos and information on all aspects of the Type VII eg. design, weapons, sensors, colours and insignia.

Trojca, Waldemar. *Ubootwaffe, Marine-Kleinkampfverbände 1939-1945*. Model Hobby, 2004.

- ⊕ The high cost of this 598 page book can be justified by the wealth of information inside. All aspects of the U-boats are covered. Many photos and side profiles are included.
Author's note: The quality of the photos are variable in the author's copy. In the first half of the author's copy, the photos have been printed much too dark. Despite this problem, the book is still highly recommended.

Wiper, Steve. *Warship Pictorial #27: Kriegsmarine Type VII U-Boats*. Classic Warships Publishing, 2004.

- ⊕ Pictorial featuring excellent images of early to late VIICs and VIIC/41s. Extremely good value.

Very highly recommended

Dallies-Labourdette, Jean-Philippe. *U-Boote 1935-1945 The History Of The Kriegsmarine U-Boats*. Histoire & Collections, 1996.

- ⊕ There are fewer images of early VIICs than in other books, but around a dozen are extremely useful for the modeller. Although the text and captions include numerous errors, the image reproduction is absolutely superb.

Ground Power Special Issue August 1996: *German U-Boat of WWII (1)*. Delta Publishing Co. Ltd, 1996.

- ⊕ There are fewer early VIIC images than in edition 2 of this Japanese pictorial. However, the images are of exceptional quality.

Paterson, Lawrence. *U-Boat War Patrol: The Hidden Photographic Diary Of U 564*. Greenhill Books, 2004.

- ⊕ Numerous photos taken on board U 564 during a patrol allow the modeller to discern many tower details that cannot be found elsewhere. Particularly useful for the inside of the tower bulwark, the attack periscope base, the UZO, and the “dashboard” area.

U-Boat Im Focus Editions 1-5. Luftfahrtverlag-Start, 2007-2009.

- ⊕ Aimed towards enthusiasts and modellers, each edition features previously unpublished photos of exceptional quality. Very rare colour images are included, while the profile drawings are detailed and of professional quality. The English language captions are particularly informative, ensuring that every detail in the large format photos is conveyed to the enthusiast. Although there are fewer photographs than in some books, the careful selection of the images allow modellers to gain additional knowledge of the VIIC.

Wetzel, Eckard. *U 995: Das U-Boot vor dem Marine-Ehrenmal in Laboe*. Karl Müller Verlag.

- ⊕ An indispensable book for enthusiasts seeking colour images of U-boats.

Highly recommended

Armes Militaria magazine: *Les U-Boote Au Combat 1. 1939-1940, Les Premiers Succes*. Hors-Serie No 66. Histoire & Collections, 2007.

- ⊕ Very good quality images of VIIBs and early VIICs.

Beaver, Paul. *U-Boats In The Atlantic*. Patrick Stephens Limited, 1979.

- ⊕ Very handy pictorial magazine. Plenty of early VIIC photos, showing tower details and insignia.

Breyer, Siegfried and Koop, Gerhard. *The German Navy At War 1935-1945 Volume 2: The U-Boat*. Schiffer Military History.

- ⊕ In the first half of this book there are a number of photos showing VIICs in dry-dock or moored in port. Some images will be very useful if a modeller is building a diorama of a U-boat moored in port.

Buchheim, Lothar-Günther. *U-Boat War*. Collins, 1978.

- ⊕ Features countless images of the real U 96 on patrol in the Atlantic. The images were taken by Lothar-Günther Buchheim during the patrol upon which he based the classic novel *Das Boot*. The reality of an Atlantic pervades this book through these very real and dramatic images. Some tower details of U 96 can be discerned.

Högel, Georg. *U-Boat Emblems Of World War II 1939-1945*. Schiffer Military History, 1999.

- ⊕ The definitive work on U-boat insignia.

Högel, Georg. *Embleme Wappen malings: deutscher U-Boote 1939-1945*. Koehlers Verlagsgesellschaft mBH, 2001.

- ⊕ Presented in booklet format, this is a useful update to the above work on U-boat insignia.

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

- ⊕ There are only eight colour U-boat images but the quality is outstanding. This German language book will be of interest to those who are primarily interested in U-boat colours.

Stern, Robert C.. *U-Boats In Action*. Squadron/Signal Publications, 1977.

- ⊕ Useful pictorial, offering good value for money.

Westwood, David. *Anatomy Of A Ship: The Type VII U-Boat*. Conway Marine Press, 2003.

- ⊕ There are less than twenty exterior shots of Type VIICs. The main benefit of the book are the numerous drawings. These drawings are essential if a modeller is improving the interior or armament. Although some errors or omissions can be found in the side profiles, they remain useful.

Recommended

Hirschmann, Werner with Graves, Donald E.. *Another Place, Another Time: A U-Boat Officer's Wartime Album*. Chatham Publishing, 2004.

- ⊕ Lavishly illustrated with a variety of quality photos, this book does contain some Mediterranean U-boat images. Also included are post-war walkaround photos of U 190 and U 889. Despite these boats being Type IXs, they are useful for enthusiasts of the late war VIICs and VIIC/41s.

Konstam, Angus & Showell, Jak P. Mallmann. *7th U-Boat Flotilla*. Ian Allan Publishing, 2003.

- ⊕ Many of the most popular U-boats among modellers served in the 7th U-Flotilla. This charts the development of the flotilla, with some useful images of the early VIICs.

Kutta, Timothy J., *U-Boat War*. Squadron/Signal Publications, Inc., 1998.

- ⊕ The accuracy of the captions has been questioned by some commentators. However, this pictorial still remains good value for money for the enclosed shots of early VIICs.

Nowarra, Heinz J.. *Grey Wolves of the Sea: German U-Boat Type VII*. Schiffer Military History, 1992.

- ⊕ Fewer shots of VIICs than in other pictorials but useful nonetheless.

Showell, Jak P. Mallmann. *Enigma U-Boats: Breaking The Code*. Ian Allan Publishing, 2002.

- ⊕ A decent resource for enthusiasts wishing to learn of the Enigma. Includes a few very good images of VIIAs, and a few good images of VIICs.

Trojca, Waldemar. *U-Boote Typ II, VII, IX*. Model Hobby, 2004.

- ⊕ If one cannot afford *Ubootwaffe, Marine-Kleinkampfverbände 1939-1945*, then this pictorial from the same author is the next best alternative. Includes photos of Type IIs, VIIAs, VIIBs, early VIICs and IXs.

Useful

Das Boot: The German U-Boat in History and Diorama. Andrea Press, 2002.

- ⊕ Essential if one is interested in a U-boat dockside or dry-dock diorama. Contains only a very few period U-boat images. But it does contain scores of quality colour images of Andrea's inspirational 1/32nd scale dry-dock diorama.

Ground Power Special Issue August 1996: *German U-Boat of WWII (3)*. Delta Publishing Co. Ltd, 1998.

- ⊕ Rather than images of VIICs, issue 3 contains images of XXIs, XXIIIs, IXs and smaller submarines. This issue does contain some good VIIC schematics (note that these schematics are the same as those included at the rear of *Vom Original zum Modell: Uboottyp VIIC*).

Miller, David. *U-Boats: The Illustrated History Of The Raiders Of The Deep*. Pegasus Publishing Ltd., 2000.

- ⊕ This hardback does not contain many images of the VIIC. But it is useful for the information it provides on weaponry and equipment on board the VIIC.

Paterson, Lawrence. *U-Boats In The Mediterranean 1941-1944*. Chatham Publishing, 2007.

- ⊕ There are a few good images of Mediterranean VIICs. More useful for those requiring information on the operational history of Mediterranean U-boats.

Showell, Jak P. Mallmann. *U-Boat Warfare: The Evolution Of The Wolfpack*. Naval Institute Press, 2002.

- ⊕ A few images are of direct use to the modeller.

Showell, Jak P. Mallmann. *U-Boats Under The Swastika*. Ian Allan Ltd., 1987.

- ⊕ There are some useful VIIC images in this book. Contains one exceptional image of the aft deck of a VIIC.

Showell, Jak P. Mallmann. *Wolfpacks At War*. Ian Allan Publishing, 2002.

- ⊕ A few VIIB photos but not useful to the VIIC modeller.

Skinner, Richard W.. *The Saint And The Sparrow: The Sinking Of U-309*. Historic Military Press, 2003.

- ⊕ Short booklet that would be useful for a modeller choosing U 309.

Trojca, Waldemar. *Ubootwaffe 1939-1945 Cz.1 (Encyklopedia Okretow Wojennych Number 10)*. AJ-Press, 1998.

- ⊕ Contains some VIIC images. Enthusiasts may be better served putting finances towards the author's comprehensive title *Ubootwaffe, Marine-Kleinkampfverbände 1939-1945*.

Trojca, Waldemar. *Ubootwaffe 1939-1945 Cz.2 (Encyklopedia Okretow Wojennych Number 11)*. AJ-Press, 1998.

- ⊕ Contains some VIIC images. Enthusiasts may be better served putting finances towards the author's comprehensive title *Ubootwaffe, Marine-Kleinkampfverbände 1939-1945*.

Appendix: Recommended Reading

Trojca, Waldemar. *Ubootwaffe 1939-1945 Cz.3 (Encyklopedia Okretow Wojennych Number 12)*. AJ-Press, 1999.

⊕ Not for the VIIC modeller as this title focuses on the Type IX.

Trojca, Waldemar. *Ubootwaffe 1939-1945 Cz.4 (Encyklopedia Okretow Wojennych Number 13)*. AJ-Press, 1999.

⊕ Not for the VIIC modeller as this title focuses on the Type XXI and XXIII.

Williamson, Gordon. *Kriegsmarine U-Boats 1939-1945 (1)*. Osprey Publishing, 2002.

⊕ Not especially useful for the VIIC modeller as this title provides an overview of the U-bootwaffe for a general audience.

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