Type VIIC Free-Flooding Vent Patterns
by Dougie Martindale

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.

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.

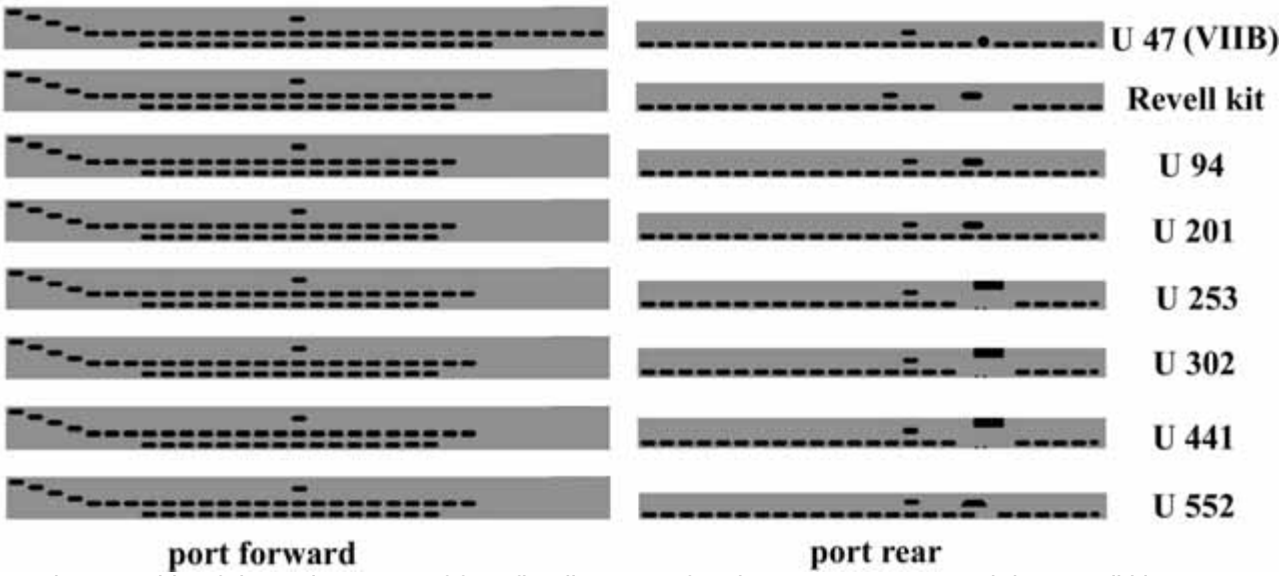
The free-flooding vents on the hull casing were not identical in each of the 660 VIIC and VIIC/41 U-boats. Variations in the vents occurred primarily between boats built in different shipyards. There were also differences between boats that originated from different batches within each shipyard. Though 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 can sometimes help us establish the rough time period in which a photo of a U-boat was taken, and can occasionally 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.

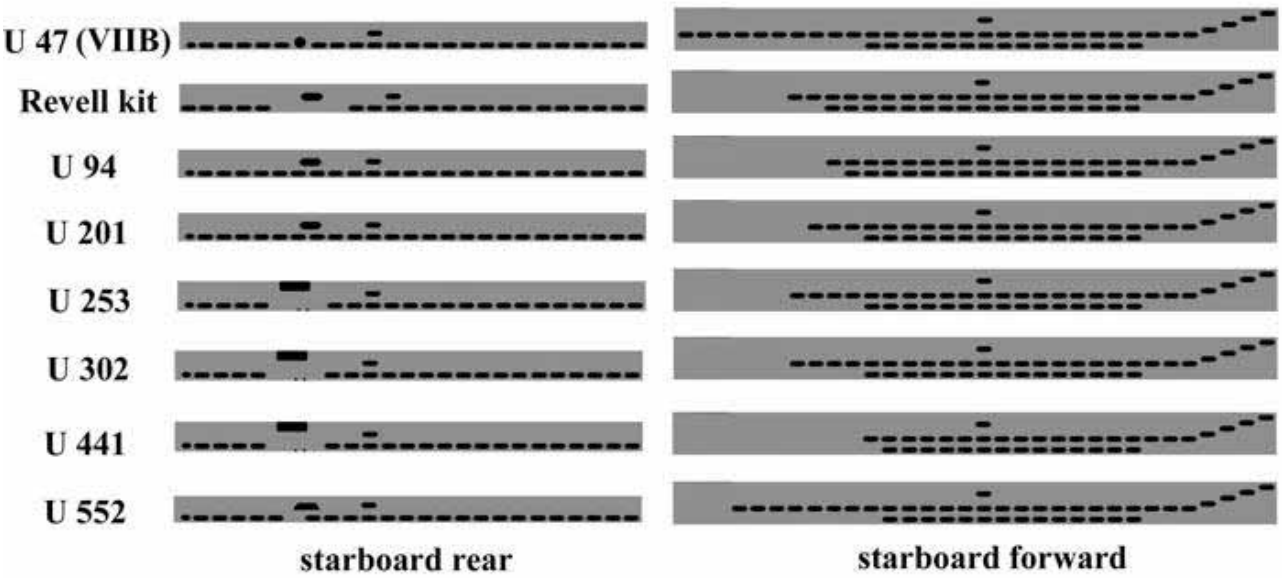
Main free-flooding vent patterns

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 01a and 01b, 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.



01a: The port side of the main groups of free-flooding vents for six VIICs, one VIIB and the Revell kit.



01b: 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.

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.

On 01b, 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.

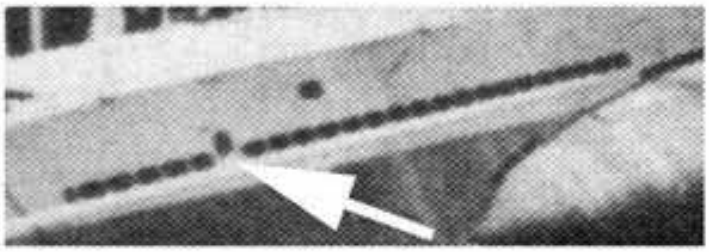
The earliest VIICs had an unbroken line of 25 vents in the rear groups. When modelling these boats, four extra vents per side should be drilled out beneath the diesel exhaust outlets. Also in the rear groups is a vent located above the line of vents, just forward of the exhaust outlet. In the Revell kit this vent has been positioned above the wrong vent; it should be located one vent further 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.

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.

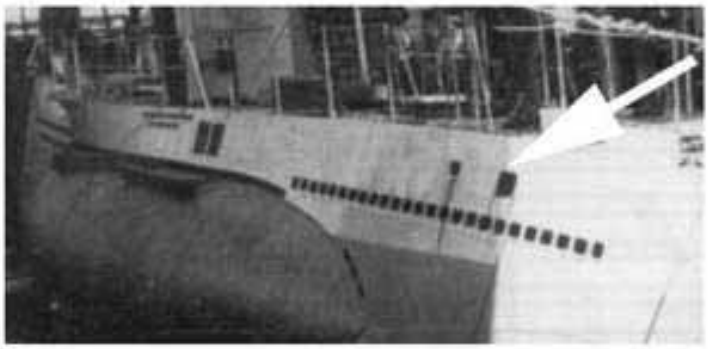
Diesel exhaust outlets

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.

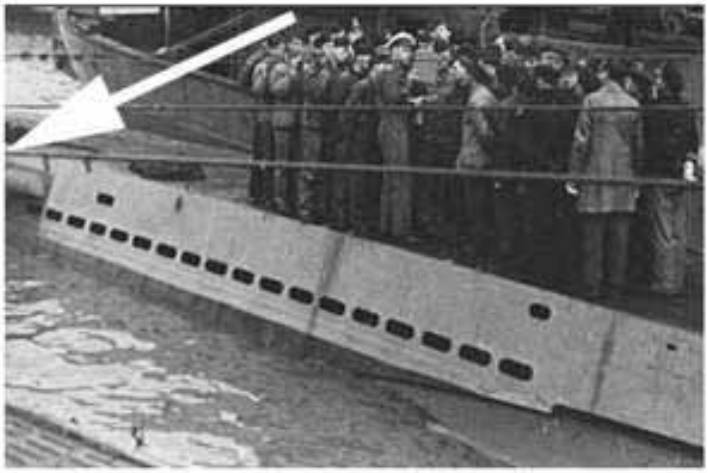
The earliest style (which I have called style 1) was a circular outlet located along the line of vents in the main rear group. This style featured on the early VIIBs in the batches U 45 to U 55 and U 99 to U 102, but not on the VIIBs from other batches or any VIICs. These round outlets were modified 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. 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.



STYLE 1
VIIB only
U 99
12th March 1940

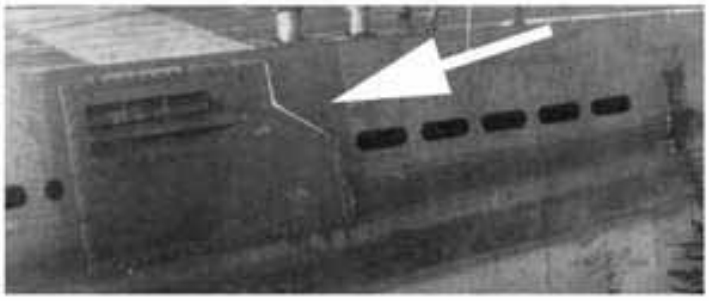


STYLE 2
U 93
8th June 1940



STYLE 3
U 552
(shrouded)

STYLE 4
U 442
12th January 1942



STYLE 5
U 1003
December 1943

02: 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.

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. In 1942, U 751 had a shroud over the outlet, plus two holes beneath the shroud.

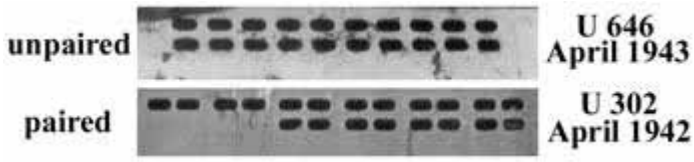
Then, at some stage beginning in late 1941 or so, boats coming down the slipways sported a new style of exhaust outlet. This outlet (style 4), which featured upon U 209, U 227, U 253, U 302, U 441 and U 704, had an almost rectangular shape with two squares below. The late VIIBs U 83 and U 86 also sported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

In 1942 the last 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. All subsequent U-boats, including U 241, U 995, U 1003 and U 1305 sported this last style of outlet.

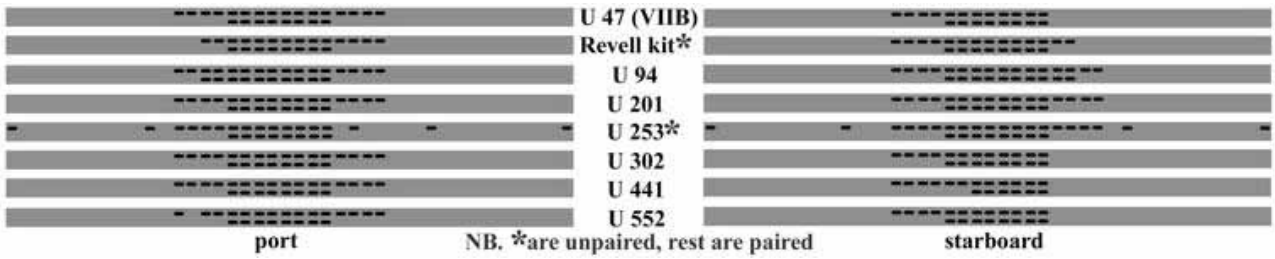
It is important to remember that some boats had different styles of outlet at different times. For example, U 203 was retrofitted with style 4 at some stage prior to April 1943, having originally had style 2 when launched.

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).



03: A comparison between paired and unpaired vent patterns.



04: 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 80, U 81, U 82, U 132, U 136, U 251, U 253, U 267, U 269, U 275 and U 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

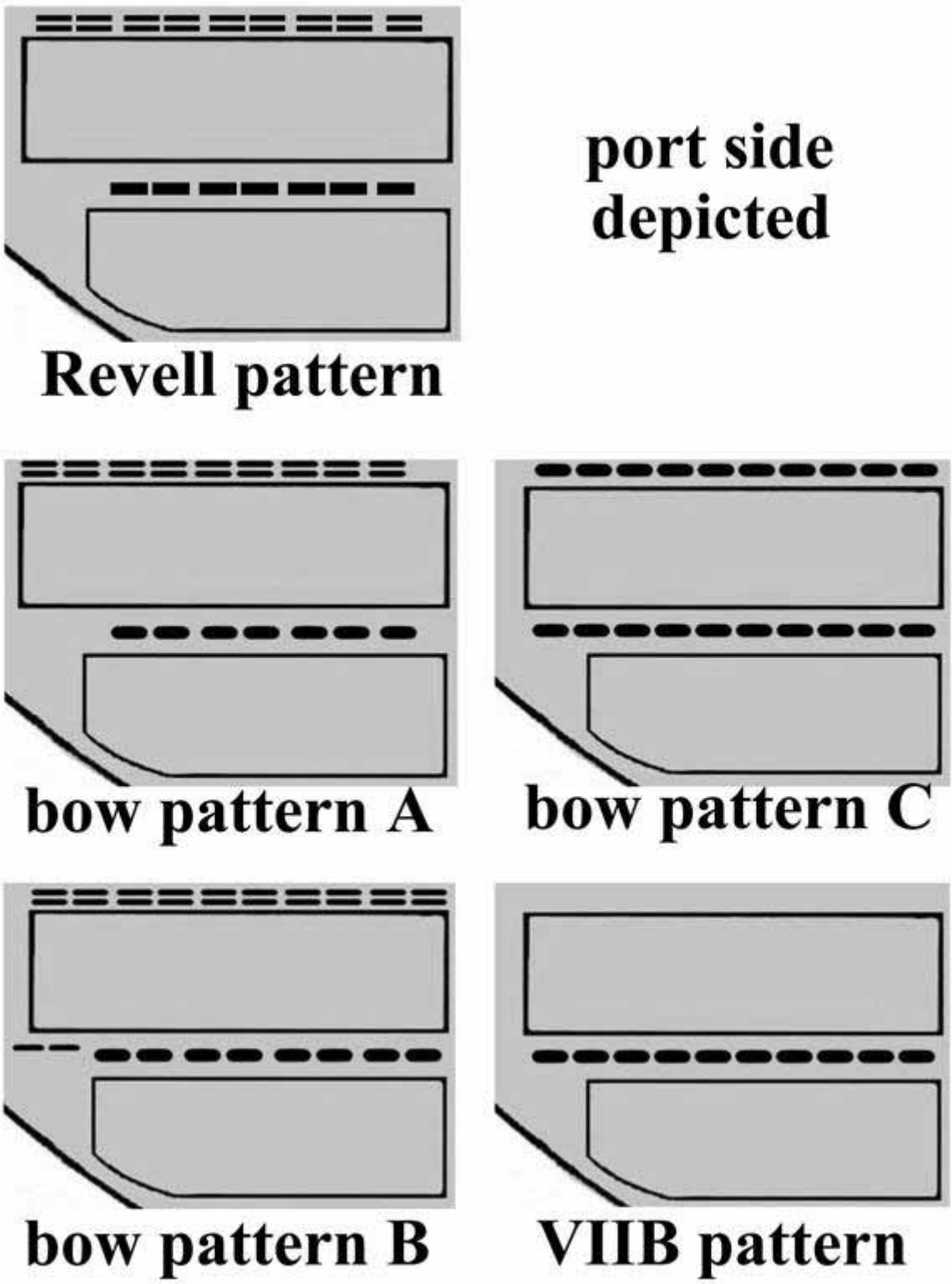
shipyard. The medium-sized vents on the U-boats from Vegesack were evenly spaced apart (unpaired). This was unusual for U-boats built at the start of the war, since all the boats from other shipyards had these vents arranged in pairs.

There are 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.

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.



05: 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.

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 69, U 94, U 333, U 407, U 441, U 451, U 458, U 471, U 551, U 559 and U 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 seen this pattern only once, in a photo of a VIIC dry-docked in Samalis in 1942.

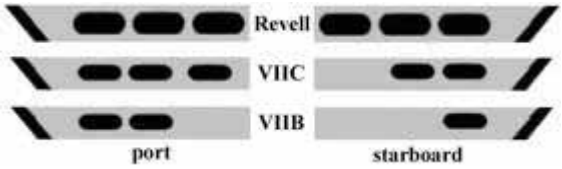
The early Type VIIBs had ten unpaired medium-sized vents between the doors (as in bow pattern C) but none above the upper doors. I have not seen any photos of late VIIBs in which this area of the hull casing is exposed, so I cannot say which pattern was present on the late VIIBs.

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 a few millimetres too long in the Revell kit. 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 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.



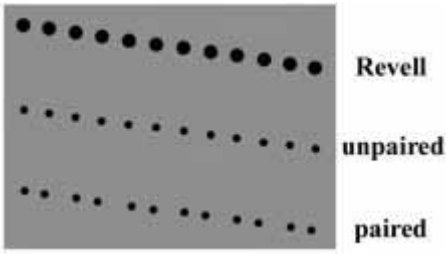
06: The oval vents right next to the stem, above the level of the upper torpedo doors.

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.

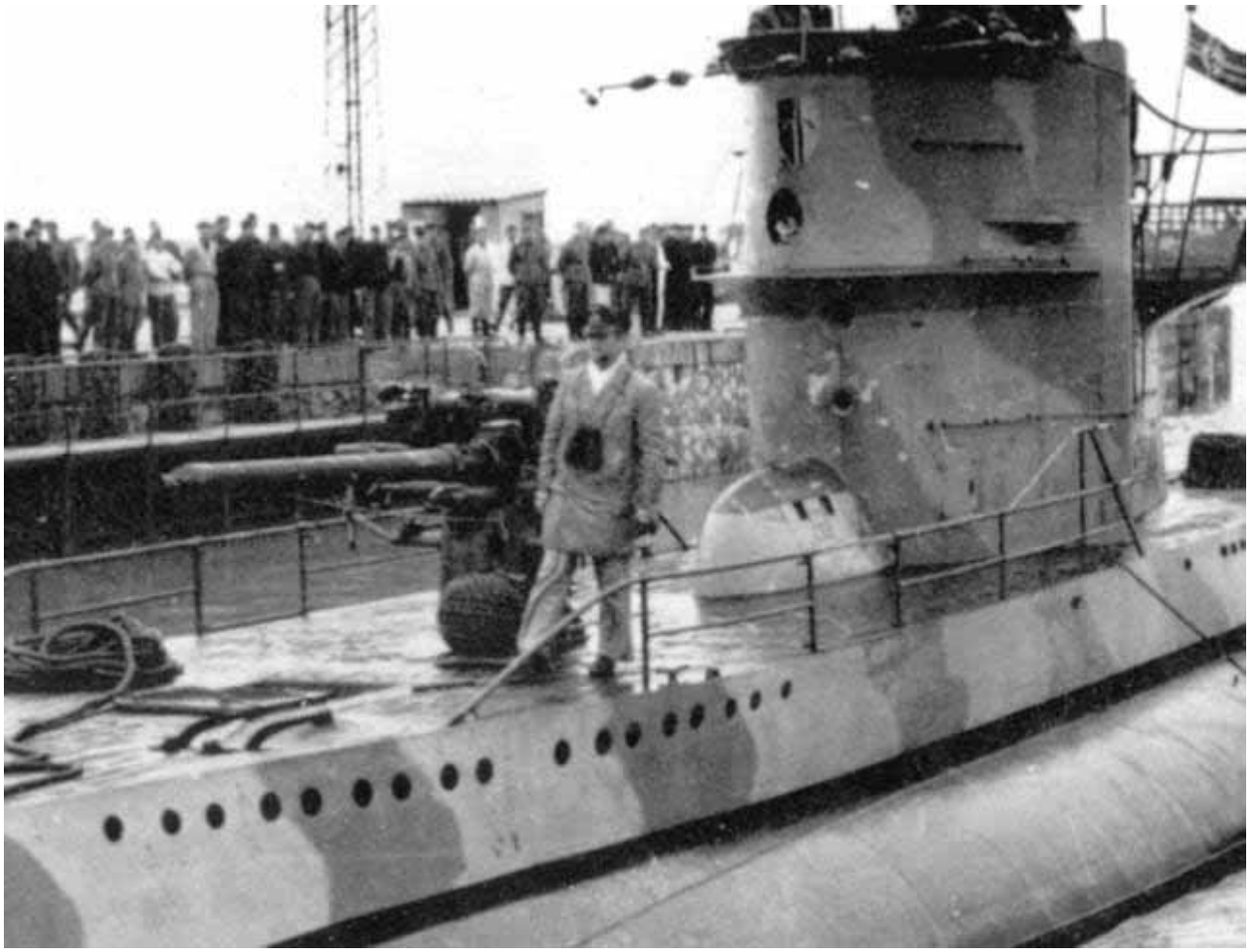
One of the most noticeable inaccuracies in the Revell kit is that these twelve vents are **much** too large in the Revell kit. Since the line of vents is also too far forward in the Revell kit, it is easy enough to rectify both these problems: simply fill in the holes in the kit and drill new and smaller ones just aft of each of the filled holes.



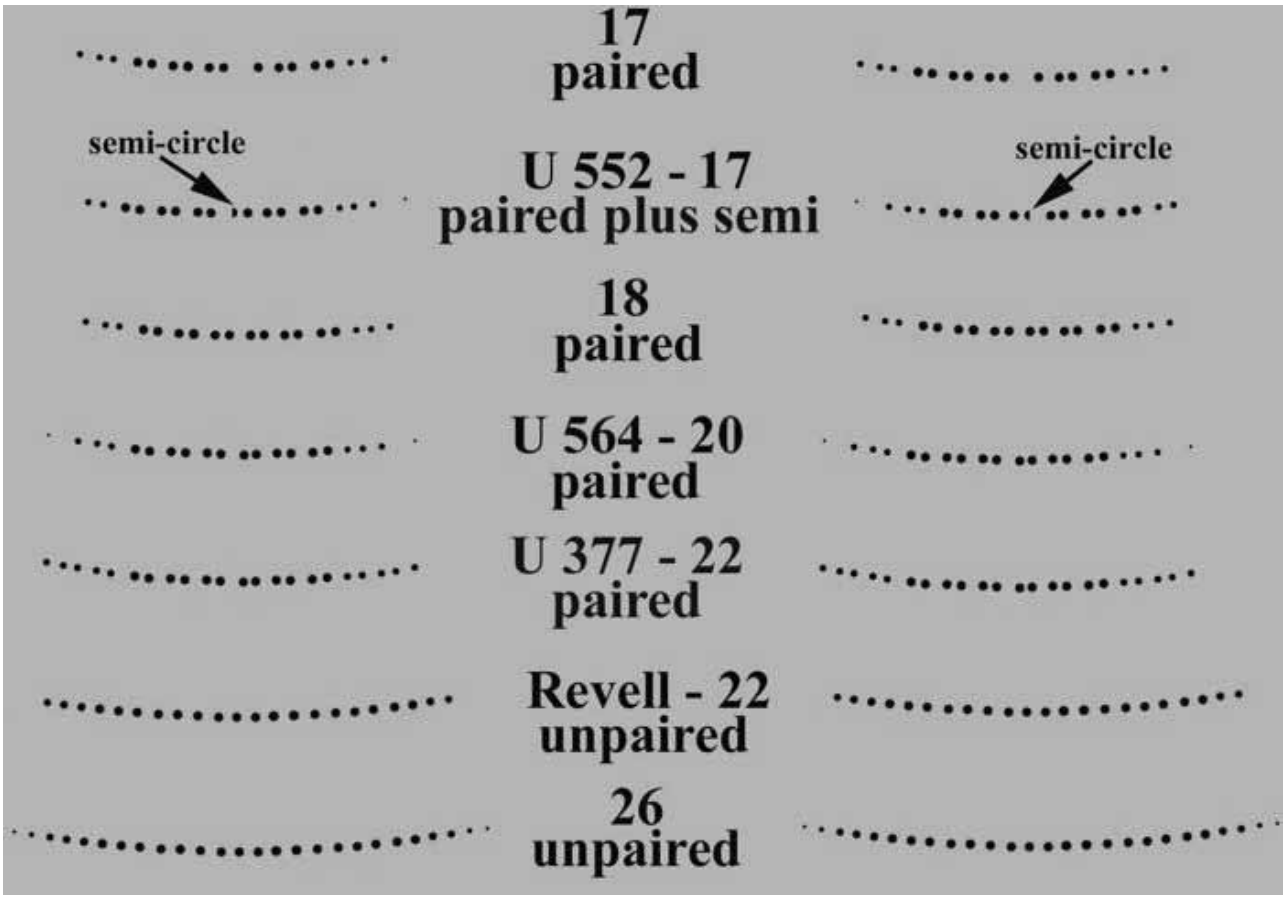
07: The difference in diameter between the circular vents on VIICs and the large vents in the Revell kit is obvious.

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. The boats with breakwaters included U 48, U 99, U 81, U 94, U 96, U 201, U 552 and U 556. The breakwaters were removed from U-boats (starting roughly in the spring of 1941) and 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.



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



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

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

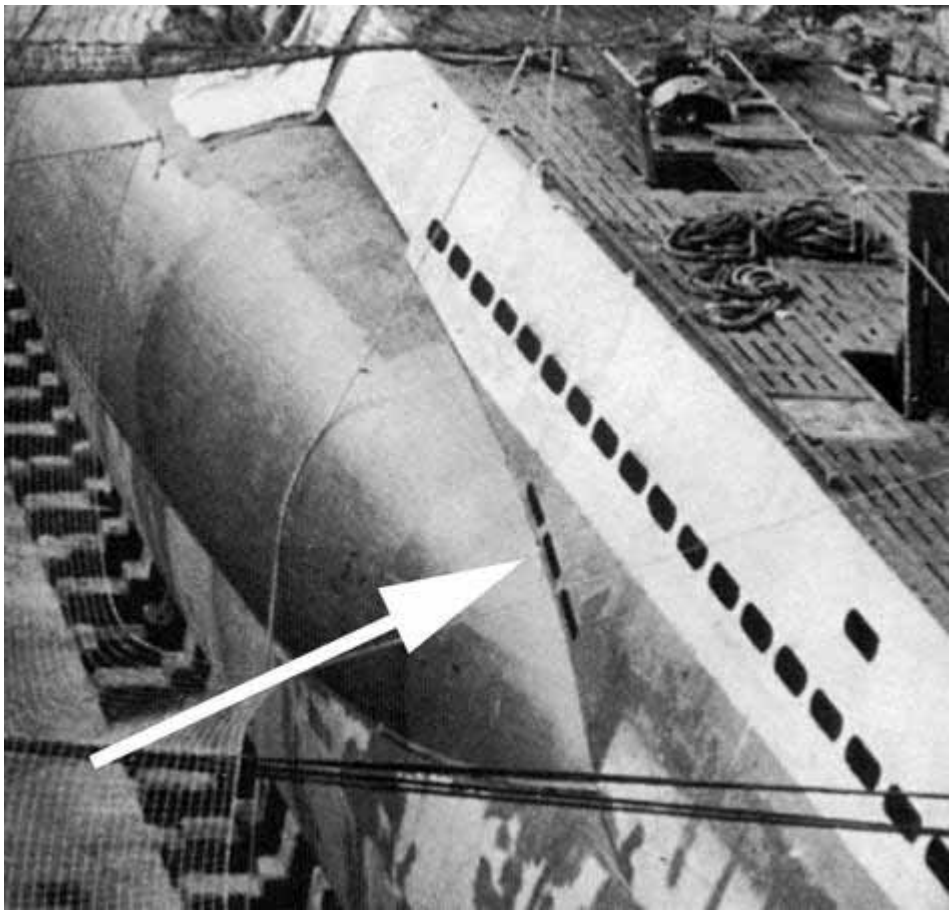
17 paired	U 81, U 82, U 251, U 253 and U 565
17 paired plus semi	U 552 (different to normal 17 paired pattern)
18 paired	U 89, U 132, U 331
20 paired	U 564
22 paired	U 377
25 unpaired	U 204 (as 26 unpaired but fill in 6th vent from rear)
26 unpaired	U 93, U 94 and U 201

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 U-boats such as U 203 which didn't have the curved lines, even when other boats did.

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.

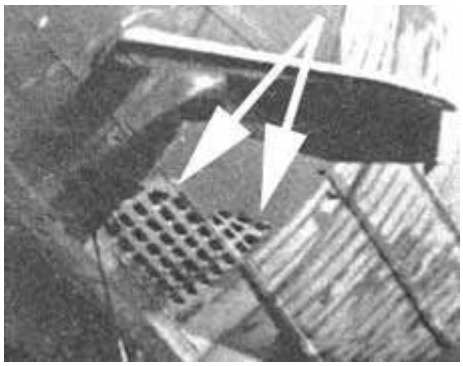


10: The three vents immediately beside the saddle tanks were more elongated in shape than the main vents above.

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-boat 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.



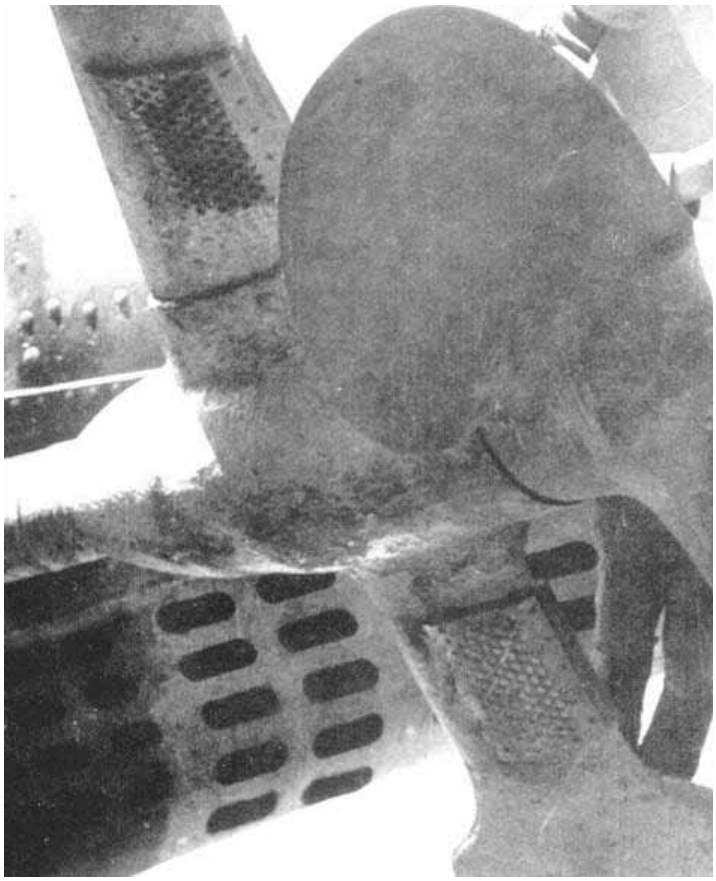
11: The right hand arrow points to a small group of vents that were present in some VIICs, but not in others. Above and forward of the vents are the port hydroplane and its guard.

12: The area behind the forward hydroplanes can be greatly improved with the Modelbrass set, fitted to the model in this photo.

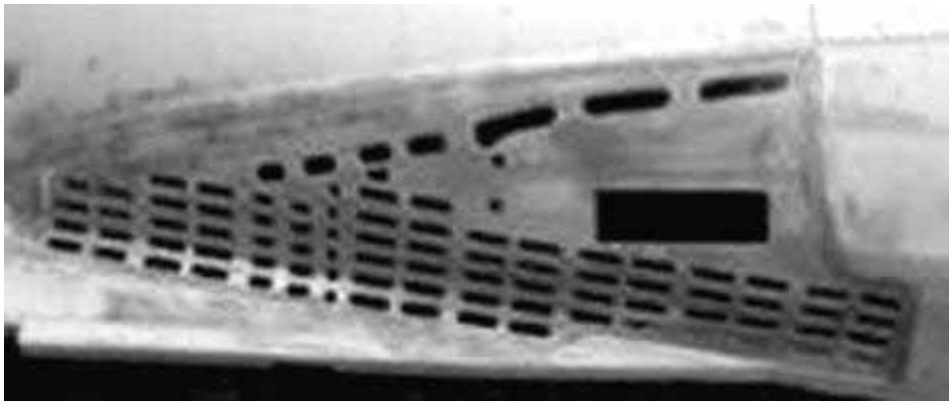
Vents near rear hydroplanes

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.



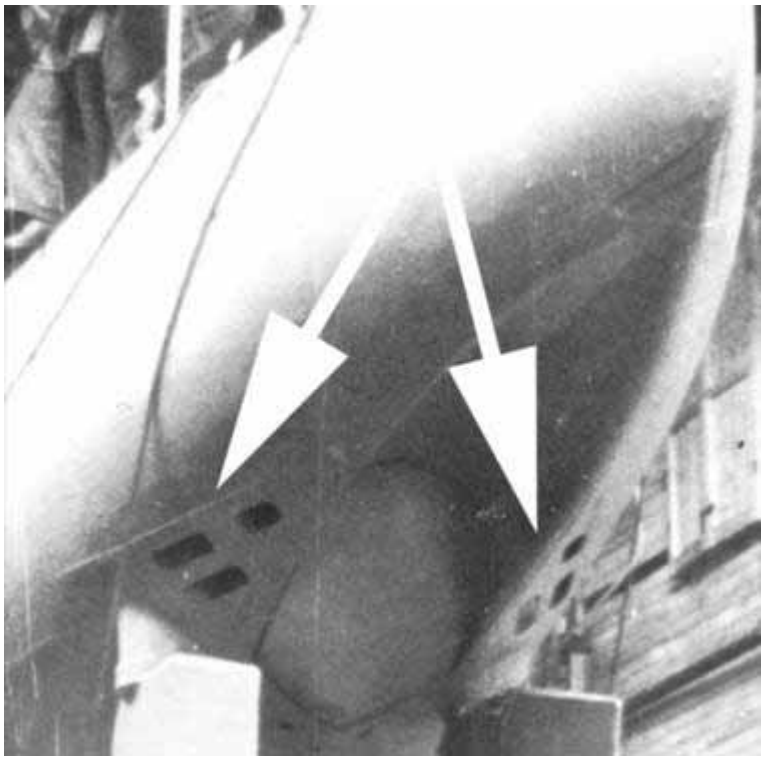
13: By comparing this photo with the Revell kit, it becomes apparent that the vents in front of the port propeller were more numerous, and different in shape, to those in the model kit.



14: Though 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.



15: Between the two sets of three vents is the aft torpedo door.

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.

16: Vertical strips have been added by Jess Montgomery to represent the ribs within the central drainage area.

Type VIIB, VIIC and VIIC/41 batches

Danziger Werft, Danzig	401-430, 1162-11703
F Schichau, Danzig	431-450, 731-750, 825-840, 1191-1210
Nordsee-Werke, Emden	331-350, 1101-1110
Flensburger Schiffbau Gesellschaft, Flensburg	351-370, 1301-1308
Blohm & Voss, Hamburg	551-650, 951-1110
H C Stülcken Sohn, Hamburg	701-730, 905-912
Howaltswerke, Hamburg	687-698
Deutsche Werke, Kiel	451-486
Germaniawerft, Kiel	45-55*, 69-72, 93-98, 99-102*, 201-212, 221-232, 235-250, 1051-1058, 1063-1065
Howaltswerken, Kiel	371-400, 651-686, 1131-1132
Flender-Werft, Lübeck	83-87*, 88-92, 301-330, 903-904
Neptun-Werft, Rostock	921-936
Stettiner Orderwerke, Stettin	821-824
Stettiner Vulcan Werke, Stettin	901-902
Vegesacker Werft, Vegesack	73-76*, 77-82, 132-136, 251-300, 1271-1279
Kaiserliche Marinewerft, Wilhelmshaven	751-782

* denotes Type VIIB batch. The rest are VIICs or VIIC/41s
Source: Westwood, David. *Anatomy Of A Ship: The Type VII U-Boat*. Conway Marine Press, 2003.

Acknowledgement

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