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SAFETY OF SAILING: LIGHTVESSELS BUILT IN KAISERLICHE WERFT DANZIG

**Bezpieczeństwo żeglugi: statki latarniowe zbudowane
w Kaiserliche Werft Danzig**

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Abstract

The safety of navigation in the Baltic and the North Sea was an important issue for the Prussian state, especially since large funds appeared after winning the war with France at the end of the 19th century. Thus, not only were lightvessels built and placed in places dangerous for navigation, but also lighthouses, shore rescue stations, etc. Shipyards located in the North Sea and Baltic Sea regions were involved in the construction of lightvessels. The Kaiserliche Werft Danzig shipyard, known for the production of warships, received an order to build as many as 7 lightvessels in the years 1871-1904. They were successively named: Aussen Jade, Minsener Sand, Adlergrund I, Adlergrund II, Stollergrund I, Stollergrund II, and Bülk. They were exhibited in various places also during the war. Brief assessments of the ships mentioned are included in this study.

Keywords: lightvessels, safety of sailing.

Streszczenie

Artykuł prezentuje niewielki fragment wyniku wieloletnich badań autorów dotyczących bezpieczeństwa żeglugi. Bezpieczeństwo żeglugi na Bałtyku i Morzu Północnym było dla prężnie rozwijającego się państwa pruskiego sprawą niezmiernie ważną. Dzięki kontrybucji wojennej, którą Prusy otrzymały po wygranej wojnie z Francją pod koniec XIX wieku, a tym samym pojawieniu się dużych środków finansowych, część z nich

została przeznaczona na zabezpieczenie żeglugi. Budowano nie tylko statki latarniowe i wystawiano je w miejscach niebezpiecznych żeglugowo, ale również wznoszono latarnie morskie, stacje ratownictwa brzegowego itp. Budową latarniowców zajmowały się stocznie zlokalizowane w rejonie Morza Północnego, jak i Bałtyku. Znana z produkcji okrętów wojennych gdańska stocznia Kaiserliche Werft Danzig otrzymała również zamówienie na zbudowanie aż 7 latarniowców w latach 1871–1904. Były to jednostki o nazwach kolejno: Aussen Jade, Minsener Sand, Adlergrund I, Adlergrund II, Stollergrund I, Stollergrund I i Bülk. Wystawiano je na różnych pozycjach morskich nie tylko w czasach pokoju, ale również w okresie wojny. Krótkie charakterystyki i oceny wymienionych statków latarniowych zabezpieczających szlaki żeglugowe w owym czasie są zawarte w niniejszym opracowaniu.

Słowa kluczowe: statki latarniowe, bezpieczeństwo żeglugi.

Introduction

This article presents a small fragment of several years of research on the safety of navigation and navigation signs. The research objective of the conducted scientific research, a fragment of which was presented by the authors in the article, was to learn about the most important issues related to the creation, development, and operation of lighthouse ships and to determine their significance for the safety of navigation. An additional goal, the analysis of which is presented in this article, was to find out the significance and contribution of Kaiserliche Werft Danzig in the implementation of the safety of shipping.

The research hypothesis was based on the results obtained by the authors in the archives of the Baltic states, it will be possible to compile and present the significance of the construction in the Kaiserliche Werft Danzig lighthouse ships.

The basis of the research process was the analysis and synthesis of sources, as well as scientific studies that were used to establish the facts, and the induction method, thanks to which, on the basis of the collected individual source materials, the research results were established and generalized. Collected material was verified and conclusions were drawn, which are presented in this article.

The sea has always played a significant role in human life. For centuries shipping lanes were used by the seamen, who ranged nautical miles reaping big benefits. Navigating the seas was a huge danger related to, among others, entering ports or overcoming dangerous shallows and underwater rocks. The economic and technical development of maritime states (concentrated around sea basins), and thus greater sea traffic, resulted in the development of navigational signs aimed at increasing the safety of sailing.

Lightvessels are specific vessels anchored in places dangerous for shipping and signaling with day and night signs, i.e. lights, a specific shipping hazard (shoal, rock, wreck, etc.). In the maritime classification, they were classified as floating navigation signs. They appeared in the Baltic Sea relatively late, at the beginning of the 19th century, and were withdrawn in the second half of the 20th century.

The situation was different in the waters of northwestern Europe, where the first signs of this type were probably anchored already in the Middle Ages. However, unlike the lightvessels seen on the seas in the 18th century, these were “periodic” navigational signs, displayed when important units were expected to return to the port of homing. The first ship of this purpose, The Nore, warned against the shoal dangerous for navigation in the Thames estuary as early as 1731. An interesting fact is that its exhibition was a private initiative. Only four years later, in 1734, this unit was taken over by Trinity House.¹

On the German coast, lightvessels were initially used as pilot floating stations, which showed light at night, to better locate them by other vessels. The first lighthouse-type vessel in German waters was the Lotsengalio, built in 1774 at the mouth of the Elbe. Nevertheless, the performance of pilot tasks was always associated with a periodic change of position, which in turn was contrary to the principle of the lightvessel operation. Therefore, in German waters, the first “real” lightvessel was the Seestern, exhibited on the Elbe in 1816, which proves that European waters showed dangerous areas when approaching to ports or river mouths. Lighthouse anchorages have been marked on nautical charts to facilitate the navigation of ships. These units also acted as meteorological stations, pilot stations, or acted as intermediaries in transmitting signals.

Discussion of research results

Over the years of operation, lightvessels have acted as a lighthouse or other beacon. During the day, the lightvessel masts showed daytime signals in the form of spheres, triangles, etc. In addition to light with certain characteristics (due to the rotation of the vessel at anchor, there could be no sector light) lightvessel had daytime signs and a clearly visible name. Usually it was a ship without a drive, permanently anchored in a place where building a lighthouse was impossible or unprofitable (pl.wikipedia.org, 2021). The range of lightvessel’s light was not large due to the relatively low height of the light above sea level. Currently, lightvessels are found mainly in museums, because their greatness has passed, instead of them, light buoys are used, which are safer and cheaper to operate. The former manned lightvessels have been replaced by automatically supervised unmanned and buoyant units (*Transpress Lexicon Seefahrt*, 1976, p. 142).

The hulls of lightvessels were usually painted red. Research has shown that this was not always the case, as the first lightvessels, built of wood, had the color of the wood preservatives of that time. In the southern Baltic region, the red color was adopted as the obligatory color after 1833. The wreck lightvessels painted green were a certain departure from the red color.

¹ The institution was established in 1514 in England, responsible for maritime safety, including lighthouses.

The early lightvessels were constructed on the lines of theoretical sailing vessels, therefore the first lightvessel visible in the southern Baltic had a wooden hull, like other modern vessels. Sailing ships were used for lighthouse purposes due to their maritime activity and the need, in the early period of their existence, to use sail propulsion without the possibility of other solutions. The analysis of the archival documentation showed that the units operated in the South Baltic Sea were relatively small compared to the units anchored in larger sea areas, they were up to 36 m long on the waterline. The largest wooden lightvessel was Adlergrund II, which was 41m long after rebuilding. One of the biggest problems that the designers had to deal with was ensuring the un-sinkability of these units. The impulse to search for appropriate solutions to this problem was, among others, the sinking of the lightvessel Seestern with the entire crew in 1816, and numerous collisions between lighthouse units and commercial units. In order to solve the problem and improve their buoyancy, the designers used heavy wooden beams as the necessary ballast, above which empty barrels or wooden boxes were attached in the holds to provide additional buoyancy to the hull. Such solutions are visible in the construction drawings of the German lightvessels from 1825. Improving the displacement of lightvessels, their buoyancy, but worsened the existence of small, usually about 3-person crews of these units (Komorowski et al., 2011, p. 382).

Research has shown that larger displacement units were usually used in the open sea. In sheltered areas, in internal waters or in lagoons, smaller units were used, which was dictated by the depths and operating costs of lightvessels. Usually they were 15–20 m long. Such structures were exploited, among others on the Stettiner Haff in the 19th century. The last lightvessel to be built on the theoretical lines of a sailing vessel was Bürgermeister O'Swald, which entered into service in 1948.

Steel hulls in lightvessels constructions appeared in the second half of the 19th century. These units were usually powered by sails, then from 1906 a steam engine and finally after 1912 diesel engines with a power of 300–500KM, which provided these vessels with a speed of about 9 knots. Such a power plant was sufficient in the event of drifting, to return to the designated position or to pass to the port for necessary repairs or inspections. Earlier designs, with a sail drive, were usually adapted to carry two sails: a gaff on the rear mast and a triangular foresail on the front. The sails, apart from the propulsion, were also used as an element increasing the visibility of the lightvessel, and during storms to relieve the anchors.

With the development of technology and the construction of steel hulls, the dimensions of lightvessels also increased. Larger hulls ensured a safer stay at sea, especially during stormy weather, and guaranteed better social conditions for the crews.

After the hulls of old sailing units were discontinued as lightvessels and works related to the construction of specialized lightvessels were started, many European shipyards began to build these ships. Research shows, that one of such shipyards was the Kaiserliche Werft Danzig, later known as the Konigliche shipyard. Initially, warships

were built there, but in the 19th century also other vessels, such as lightvessels, were built. The conducted research allowed to establish that at the turn of the 19th and 20th centuries, 7 light vessels were built in the shipyard, with hulls initially made of wood, and later made of metal. These included units that are discussed later in the article.

The first lightvessel was Adlergrund I, built in 1884. The seagoing lightvessel, operated in the years 1884–1919, exhibited at the position: width: 54°48'10" N, length 14°21'59" E. Unlike the lightvessels from the Stettiner Haff, it was much larger, which confirms the thesis on taking into account the safety and work conditions of the crew when designing offshore lightvessels units. The displacement of the vessel was 282 tons with dimensions: 40.00 m long, 7.00 m wide, and with a draft of 3.00 m. The vessel was built in Kaiserliche Werft Danzig as required by Hydrographisches Amt in Berlin and Künstenbezirksamt II in Stettin. The reason for placing the order at the shipyard was the need to increase the safety of navigation in the Adlergrund shallow water area, which was intended to be achieved by displaying a lightvessel. Several years of discussions on this subject were completed in 1870. The ship was marked in the shipyard as construction no. 38, and the order was carried out in 1883/84. Like most of the then units of this type, the lightvessel was a wooden structure equipped with two masts. The cost of construction and equipment was 257,000 Marks. Adlergrund I was launched on May 17, 1884 and after the outfitting phase, it was put into operation on August 21, 1884 to Lotsenkommando der Jade/Künstenbezirksamt II, Stettin. On that day, it began its service in the Adlergrund position.² On June 30, 1901 it was transferred to the new position 54°50'02" N; 14°21'59" E. With the technological advances in radio communication, Adlergrund I was probably equipped with a radio in 1913 and was assigned the "KAG" call signal. The period of World War I was the delegation of lightvessel to the Kaiserliche Marine, where it was used as a war lightvessel. Adlergrund I ended its history a year after the war, when it was written down from the list of ships.

Another Adlergrund lightvessel, this time called Adlergrund II, was launched in 1885 (Łomniewski et al. 1975, p. 21).³ It was another unit placed on the Adlergrund position, which was given the number II to distinguish it from the previous one. Lightvessel operated in the years 1885–1896. After 8 years of service, in 1892, it was renamed to Stollergrund and moved to a new position: latitude 54°30'03" N, length 10°17'00" E. Like its predecessor, the ship was built in 1884 in Kaiserliche Werft Danzig on behalf of the same institution – Hydrographisches Amt in Berlin. The lightvessel was launched on February 21, 1885 and commissioned on May 22, 1886 to Lotsenkommando der Jade/Küstenbezirksamt II, Stettin. It was a two-masted vessel with a 10-man crew of the same dimensions as the previous one. Length 40.00 m, width 7.00 m, draft 3.00 m.

² Adlergrund – is the name of a shoal (shallow) in the southern Baltic, on the routes leading to Swinemünde. The minimum depth in the shoal area is 5–6 m.

³ Later, this unit was used in a different position and was called Stollergrund I.

The displacement of the unit was 282 tons. However, due to its original purpose as a backup lightvessel, the cost of its construction was much lower and amounted to only 198,098 Mark. The difference in price was due to its intended use. It was not built as a primary light vessel, but as a backup for Adlergrund's position, low cost resulted in minimized equipment. A characteristic feature of reserve lightvessels was that they replaced other lightvessels during their renovation or repair, which in the time of searching for savings led to limiting their equipment, and thus reducing construction and operating costs. In 1892, after the Adlergrund II was moved to the Stollergrund position (lat. 54°30'03" N, long. 10°17'00" E), and probably after retrofitting, the ship became the main lightvessel named Stollergrund. On October 9, 1896, the vessel classified as incapable for service and listed on the list of ships, a rotten wooden hull was the reason for this decision.



Fig. 1. Lightvessel Adlergrund – silhouette
Author: Spirydion Sierakowski

The history of lightvessels at the Adlergrund position continued over the following years and the appearance of the Adlergrund III ex ALMIRANTE ABBREU unit.⁴ The third and last of the series of lightvessels of the Adlergrund item number III, used in the years 1913/14 – 1945, although it was not built at the Kaiserliche Werft Danzig, but at the Nüscke & Co., Stettin shipyard. The ordering party for the construction was the German Government, which placed the order to build the vessel which was to be

⁴ This unit is presented in this material because it has connections with the predecessors of the same name. Built in Stettin, it complements the material with *Adlergrund* lightvessels.

a gift to the Brazilian government. However, the outbreak of World War I made it impossible to transfer the unit to the Brazilians. Consequently, the vessel was taken over by the Nautische Department des Reichsmarineamtes in Berlin (Pietkiewicz 2014, p. 114).

Adlergrund III was launched on May 16, 1914. It was longer and larger than its predecessors. With a length of max. 47.50 m, width 8.00 m, and draft 2.50 m displaced 500 tons. It was a two-masted vessel. A 100 W light was installed on the first of the masts at a height of 4.1 m. The daytime sign of the lightvessel was a black ball placed on a foremast. The unit had its own drive, which consisted of 2 Deutz engines. These were 6-cylinder, 4-stroke diesel engines with 120 HP each, which in 1938 were replaced with newer ones with a power of 160 HP, driving 2 propellers. The diesel power plant was able to reach a speed of 6 knots, and after replacing the engines, the ship could reach 8.5 knots. Due to the period in which the lightvessel was built and operated, it was often used as a war lightvessel. It was used for the first time as a war lightvessel on March 21, 1918. on position 12 (Item 12), as part of the Dagö-Ösel landing operation (seizure of the Baltic islands – Hiiuma and Sarema). In December 1919, it was transferred to the Küstenbezirksamt III Kiel, and in 1922 it became the main lightvessel anchored in the position of Adlergrund.

After World War I, in 1931, the unit underwent modernization, in which the scaffolding with a fog siren on the aft deck was removed, both masts were extended to 26 m, and a steel bunker was attached to the front mast with transmitters of pneumatic fog signals on its clew. In the years 1941–1945, as was the case during the previous war, the unit switched to the Kriegsmarine management, where it was used in the system for marking fairways on the Baltic Sea as: Sperrwachtschiff 17 (farm supervision), Position Rot 07, DWO 127, Wachtschiff 5 (Supervisor 5). For self-defense purposes, in 1940, the lightvessel was armed with two 20mm cannons, with an ammunition of 5000, and its staff consisted of 10 people, as before. On May 3, 1945, as a result of an air attack, Adlergrund III sank in the Bay of Mecklenburg on ENE from Staberhuk at the position: 54°27' N and 11°32' E. After the war in 1953, the wreckage was lifted, which was noted in the sailing news from 1953, its further fate has not been established.

Another lightvessel unit built in the Danzig shipyard was the Stollergrund I. On September 5, 1892, the German navy deployed a lightvessel on the approach to Kieler Förde in the Stollergrund area. Until 1896, this position was used for the lightvessel built in 1884/85 in Danzig, which was also used as a reserve for the Adlergrund position. His successor was the Reserve Ostsee issued in 1896, and the list was completed by the Stollergrund II built in 1898 in Danzig.

The lightvessel was a two-masted ship traditionally painted red with the name of the position in white on both sides. On the main mast, 11.2 m above the waterline, there was a former lantern with kerosene lamps. The lightvessel was probably showing a group flash light with a period of 30 seconds. Its day sign was a black ball placed on top of the mainmast. The light source itself probably consisted of two groups of lights

with two mirrors placed on a steel ring. The light covered the 45°–135°–45°–135° sector. The mechanism which gave the light characteristics was probably driven by a clockwork in the lantern. In the case of poor visibility, the lightvessel broadcast fog signals using the siren, it was a low and high tone transmitted in the period of 40 seconds. In the event of a siren failure, the fog signals were sent using the ship's guns and bell. After the opening of the Kiel Canal, the lightvessel was initially used as a base for canal and port pilots at the port of Kiel.

Another vessel stationed in the Stollergrund position was the lightvessel built in the Danzig shipyard called Stollergrund II (later Gabelsflach). The ship was built in 1897/98 at Kaiserliche Werft Danzig as construction No. 48, commissioned by the Nautische Abteilung des Reichsmarineamtes. It was intended as the successor of the lightvessel Stollergrund I ex Reserve Adlergrund built in 1883/84. After commissioning, the unit was subordinated to Küstenbezirksamt II in Stettin.

It was not a large ship. With dimensions of 34.00 m long, 6.40 m wide and with a draft of 2.15 m, it displaced 248 tons. Like most units, it did not have its own propulsion. The Stollergrund II was a single-masted vessel. The mast was used to raise the navigation lights (lanterns). Already in the fall of 1898 (October 21, 1898), it was placed on the Stollergrund position in Kieler Förde (approximately: 54°30'25" N and 10°17'40" E). This position was maintained until 1905, when the opening of the Kaiser-Wilhelm Kanal made it necessary to move the unit to a new place called Gabelsflach, which took place on 6 June 1905. The change of dislocation was automatically associated with the change of the name lightvessel to Gabelsflach. During World War I, the lightvessel was taken from its position. It returned to its place after the war on March 20, 1919. It did not serve too long in this position, because in 1922 the position of lightvessel was deleted, and the ship itself was moved to the new position of KIEL (54°39' N and 10°18' E). The final year of lightvessel service was 1925 when it was struck off the lightvessel list. Its fate was fulfilled in 1941 in the scrap yard.

The Lightvessel Bülk (later – Kiel I) was built in 1903/04 at the Kaiserliche Werft Danzig, commissioned by the Nautische Abteilung des Reichsmarineamtes as construction number 56, later transferred to Küstenbezirksamt II in Stettin. It was a two-masted vessel with a steel hull 35.5 m long, 7.08 m wide, max. 2.86 m, and a lateral height of 3.56 m. The vessel did not have its own mechanical drive. Like most ships of this type, the lightvessel was painted red with the name of the position in white visible on both sides. The daytime lightvessel sign was a black ball placed at a height of 22.5 m. The light source – lantern – was also placed on this mast at a height of 11.2 m. Lightvessel began its service in May 1905. Initially, the source of light was a kerosene lamp on the main mast, giving a flashing light with a period of 8 seconds. In order to transmit fog signals, the ship was equipped with a compressed air typhon which, in the event of a failure, was replaced by firing from the gun and tapping the ship's bell. During the modernization, which was carried out in 1928/29, a radio beacon was installed on the

vessel and the main light source was changed. At that time, an electric bulb with a power of 500 W/110 V was used, mounted on a gimbal suspension with a lens belt with a focal length of 300 mm. This source gave light with the power of 12,000 HK⁵ and was visible at a distance of 12.5 NM. At that time, the location of the day mark was also changed, and it was moved from the mast to the bow stay.

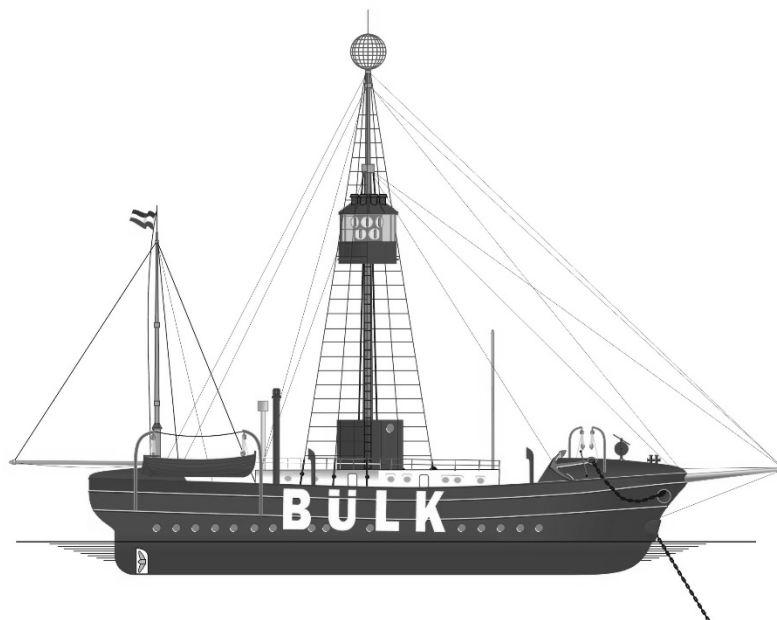


Fig. 2. Lightvessel Bülk from the Kaiserliche Werft Shipyard
Author: S. Sierakowski

During World War I, lightvessel was used by the navy, incl. in March 1918 at the position near the island of Dagö to mark the worn fairway. After the end of hostilities on July 22, 1919, it returned to its place in the Bay of Kiel. In 1924 it was renamed KIEL and was subordinated to the Wasserbauamt Kiel. In 1931 (07/21/1931) it became a reserve lightvessel and once again changed its name to Reserve Ostsee. During World War II, it was used by the Kriegsmarine as a guardship of the KIEL network farm (November 1939), a guardship – (Hafenschutzboot) – at the turning points of the fairways (including DK 06; DPr 15-1943). When the vessel was used as a caretaker of net rows and other barriers (during the war), the vessel did not have a mast with a lantern, which was dismantled. After the end of the war, it was restored to lighthouse service and was again given the status of a reserve lightvessel. Lightvessel ended its career as a ship on March 23, 1954 after it was sold to the ship scrapping company Hans Schrott und Nutzeisenverwertung from Hamburg.

⁵ HK – a unit of light intensity equal to 0.9 Kandel. The founder of this unit (Hefnerker) was the German scientist Friedrich Franz Hefner – Alteneck (1845–1904).

Another vessel built in the Kaiserliche Werft Danzig shipyard was the Minsener Sand – a metal-hulled lightvessel built in 1874. It was a three-masted schooner, on which masts were mounted day and night navigation signs warning ships against a dangerous area (rock, shallow, obstacle). Initially, only the largest lightvessel mast at a height of 19.4 m above the deck was suspended in a red ball with a diameter of 1.8 m. The ship was ordered by the Prussian Hydrographic Office from Berlin.

After the reconstruction in 1903, two lights were installed on the mainsail (15.7 m high) and on the foremast (9.4 m high) and black spheres as day signs. The lightvessel Minsener Sand was initially placed near the Roter Grund shallow at 53°48'36" N. 08°01'48" E. Later in service, its stationing position was updated according to changes in depth and shifting bottom sands in this area.

Aussen Jade. This was the name of another light vessel built in Danzig at the Kaiserliche Werft Shipyard in 1871. The wooden-frame lightvessel named Aussen Jade was intended for marking the shoals of the North Sea. Later, it was located on the fairway that led to the Kriegsmarine base in Wilhelmshafen. The position at which this navigational mark was displayed was determined by the following coordinates: latitude 53°52' N and length 07°57' E. A vessel with a three-masted structure initially showed a ball on the middle mast during the day, and then two balls on a seal and mainsail. At night, of course, it shone with a constant light placed on the mainsail.

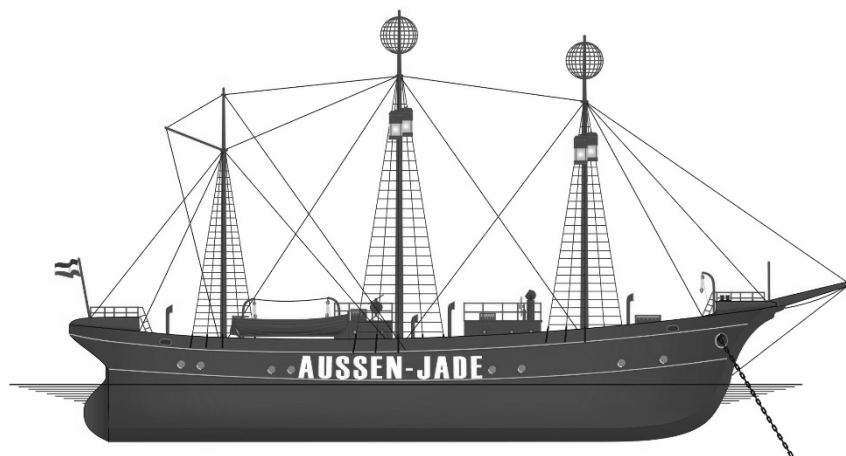


Fig. 3. Lightvessel Aussen Jade in its splendor
Author: S. Sierakowski

As a result of the poor technical condition of this lightvessel in 1902, it was decided to replace the wooden ship with a steel structure, and the order for the construction was given to the Meyer Papenburg shipyard, i.e. not the Danzig shipyard. The new lightvessel served many years and after the end of the navigation service, it was already

sailing as a sailing vessel with different names (White Sark, Suse and Sunthorice). Back in 2011, this unit participated in the Kiel Week sailing rallies or the Hanse Sail.

Conclusions

Based on the analysis of the research results, it can be concluded that the increasing intensity of navigation on seas and oceans required the development of modern rules of navigation safety. This entailed the development of better navigational markings for shipping routes, and this, in turn, forced maritime states to increase the construction of both small and large navigational signs. In order to increase the safety of navigation on the seashores, lighthouses were built, and buoys, sometimes also lighthouses, were placed in dangerous waters near obstacles.

The analysis of the research results, as well as the verification of the research hypothesis, allowed for the formulation of conclusions that the lighthouse units were built in many European shipyards, and one of them was located in the present Polish lands, Kaiserliche Werft Danzig, later called the Imperial, whose lighthouse ships are presented in this study.

When assessing the entirety of the waters of the Baltic Sea and the lightvessels placed on them, it should be noted that at the turn of the 19th and 20th centuries over 150 lightvessels were recorded in dangerous areas, to which the activities of the Kaiserliche Werft Danzig also contributed.

They were wooden and later also steel-built units, exhibited by Denmark, Finland, Germany, Sweden, Russia, and other countries. The lightvessels exploitation process lasted practically until the late 1980s, when units of this type were decommissioned after the construction of permanent navigational signs on the seabed and the use of large automatic buoys. The development of technology has contributed both to the introduction of modern rules of shipping safety and the use of newer instruments for this purpose.

After 1988, most of the lightvessels were removed or replaced with unmanned units or buoys, which are cheaper to operate. The history of lightvessels is also the history of their crews, people whose service took place in very difficult and dangerous conditions, but it is a topic for another study. Today, there are no manned lightvessels on the seas – they have remained in ports as museum units or perform other functions far from their original purpose (hotel and catering facilities). Sentiment and memories remain from the period of activity of these beautiful ships.

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