

DEVELOPMENT OF THE WHITEHEAD TORPEDO IN RIJEKA AND THE IMPACT TO THE WORLD NAVIES

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INTRODUCTION

The new automotive “fish torpedo” developed by Robert Whitehead in Rijeka/Fiume had a major influence on the naval situation and within ten years all important navies had taken licences to use the Whitehead torpedo.

This paper focuses on the development and the following “race” to introduce the torpedo in the major navies. It is based mainly on sources from Austria, Germany, Great Britain, Italy and the USA.

Excellent publications on the history of the torpedo and the Whitehead Factory are from Edwyn Gray¹ and from Antonio Casali/Marina Cattaruzza².

The Torpedo Factory in Rijeka was one of the leading research and production facilities until 1914 and the torpedo itself is still a major naval weapon in the 21st century.

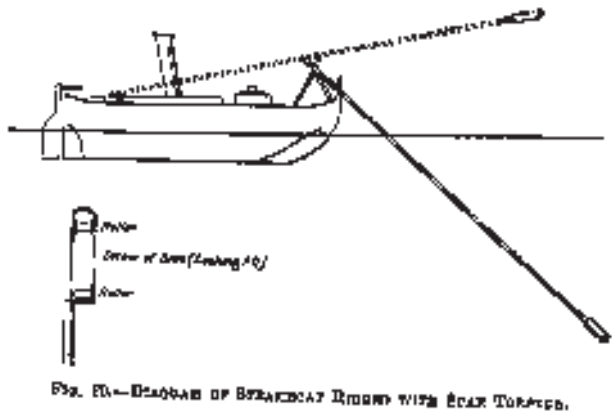
THE EARLY DEVICES

The idea to attack ships or objects by explosives is old and floating mines were used a long time. Examples are the mining vessels used by the Italian engineer Frederico Gianibelli to blow up the Spanish barrier across the river Scheldt³ in 1585 or the concept of the spar torpedo by the Dutchman Cornelius von Drebbel, demonstrated at the river Thames as early as 1620 in front of King James I.

¹ Gray Edwyn, *The Devil’s Device, Robert Whitehead and the History of the Torpedo*, 1991. Hereafter cited as Gray

² Casali Antonio, *Cattaruzza Marina, Sotto i mari del mondo, La Whitehead 1875-1999*. 1990. Hereafter cited as Casali/Cattaruzza

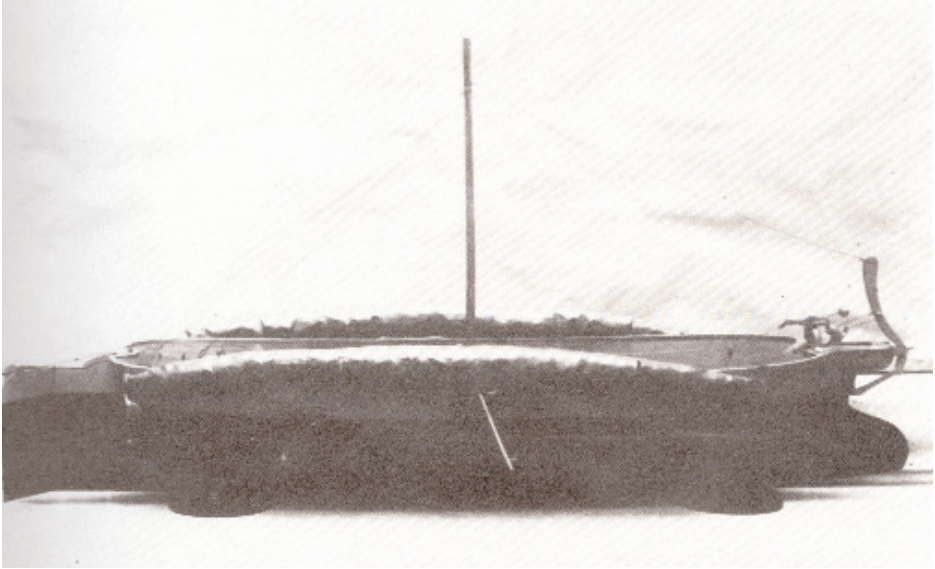
³ Gray, 61



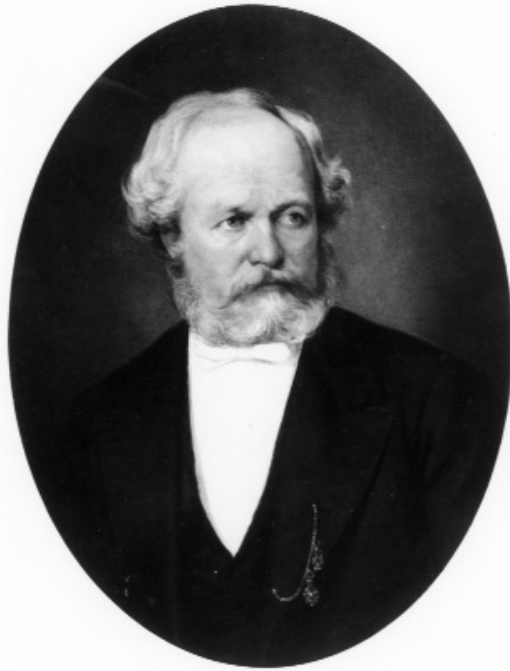
Spar torpedo boat



Explosion of a spar torpedo



Explosion of a spar torpedo Model of the "Kuestenretter" from G. Luppis



Robert Whitehead

The spar torpedo, which had an explosive device on a long spar to get it under board of enemy vessels was used throughout the end of the 19th century with success. But its explosive causes some danger to the delivering vessel and this vessel could also easily be detected if the watch on the supposed victim was alerted.

The American David Bushnell built the submarine TURTLE, which had a device to attach an explosive mine to the underwater part of ships. The attack of the TURTLE against the British frigate EAGLE of Manhattan Island in the night of September 6, 1776 failed, but the name “torpedo” used by Bushnell for his underwater weapon stuck with the underwater explosives for the next hundred years.

1800 the American Robert Fulton built his submarine NAUTILUS and tested it in the river Seine in Paris and planed to equip it with a towed torpedo. In the following years he developed various mines and towed torpedos he also demonstrated successfully. He used also a harpoon gun to attach the mine line to the attacked vessel and had some ideas on a submarine gun, but with his death in 1815 all further test stopped.

Remote controlled mines and the spar torpedo were the predecessors of the “automotive fish torpedo”.

GIOVANNI LUPPIS AND HIS “KUESTENRETTNER”⁴

1859/60 the Austrian frigate BELLONA was stationed in Cattaro to protect the southern Adriatic coast from a possible landing of Garibaldian troops. During that time Commander/Fregattenkapitän Giovanni/Johann⁵ Luppis was in command of the Austrian frigate and started his work on a mobile mining boat to defend the coastal waters. An US source⁶ stated later that “*an officer of the Austrian Marine Artillery conceived the idea of a small torpedo boat floating on surface*” and after the death of this unnamed officer, which occurred before he made any practical experiments with his invention, his drawings and papers inspired Luppis.

In 1860 a primitive model of Luppis “Kuestenrettner” (coastal saver or defender) was manufactured onboard the BELLONA.⁷

⁴ The following is based on “*Die Entwicklung des technischen Wesens der k.u.k. Kriegs-Marine in den letzten 50 Jahren*, Jahrgang 1899, Wien. The author is still doing research in the Austrian State Archiv for more details and confirmation of various facts.

⁵ In Italy he used Giovanni, in the Austrian navy he was called Johann Luppis as in *Militär-Schematismus des Österreichischen Kaiserthumes*, Wien December 1859, page 527

⁶ Barber F. M., Lieut. U.S. Navy, *Lecture on the Whitehead Torpedo*, U.S. Torpedo Station, November 20, 1874, page 3

⁷ Braun Theodor, *Die Kindheit des fünfundsiebzehnjährigen Torpedos*, 1935. Hereafter cited as Braun

The model had on both boatsides belts of cork to keep it afloat, a clockwork was used to drive the propeller and two parallel steering paddles at the aft were controlled via lines. Luppis wanted to steer the boat from the coast via lines which was very unpractical. The explosive storage was in the bow and a percussion detonator from an navy pistol was used for ignition once the vessel hit the target.

The real vessel should have a length of 6 meters but there was no solution for the propulsion and the steering with lines would have been very complicated and limiting.

Luppis retired from the navy in 1861 and settled in his hometown Fiume/Rijeka⁸. He continued his project.

In 1864 he approached the Austrian War Ministry with his invention and asked for 5000 Gulden to build a prototype for tests, but got a negative answer as the shortcomings of his model did not promise a success.

Luppis now contacted the General-Genie- and Fleet-Inspector Archduke Leopold and asked for an audience with Emperor Franz Joseph in Vienna. Luppis was allowed to demonstrate his model of the “Kuestenretter” to the Emperor. Franz Joseph gave the order to the Genie-Committee to check the invention again, but the answer was again negative.

ROBERT WHITEHEAD AND THE FISH TORPEDO

During this time Luppis met in Rijeka Giovanni de Ciotta, retired Lieutenant-Colonel of the Genie-Corps and the English engineer Robert Whitehead. Whitehead, co-owner and technical director of the “Stabilimento tecnico fiamano” had an excellent reputation as engineer.

Ciotta, Luppis and Whitehead agreed on the possibilities of the further development of the idea and on August 14, 1864 signed a contract on the future project.

Whitehead realised the shortcomings of the existing project and had the idea of the submersible cylindrical torpedo. He chose compressed air to drive the device via the propeller. More difficult was the solution to keep the torpedo in the pre-determined depth. He developed his famous “secret chamber”, which contained a relatively reliable depth-regulator.

In order to keep the invention secret the manufacturing of the prototype was mainly done by Robert Whitehead, his son John, the technician Hannibal Ploech and the artisan Sonza. In October 1866 Luppis and Whitehead informed the Austrian Navy on their results and asked for the possibility to demonstrate their invention.

⁸ Luppis was born in Fiume on 27th January 1813

The first Torpedo was made of steel with a length of 3,35 m, a diameter of 0,355 mm and 136 kg weight.

On December 21⁹, 1866 the first demonstration of the prototype torpedo was made with Vice-Admiral von Fautz, Colonel Türkheim and Shipbuilding Inspector Romako present. The torpedo was fired against a target line of 36 m from 370 m with good results and a very positive report was sent to the k.k. Reichkriegsministerium in Vienna.

It was clear that the prototype torpedo still was in his infancy but nevertheless the first letter of intention was signed between Whitehead and the Austrian Navy on March 6, 1867. The idea was to fit a gunboat with a launch tube and continue the tests.

It is interesting that as early as in January 1867 the British Admiralty received reports about this tests via their ambassador in Vienna.¹⁰

A contract between the Austrian Navy and the inventors was signed on May 20, 1867, which foresaw a fee of 200.000 Gulden for the inventors in case the Navy would purchase the torpedo and allowed nevertheless to the inventors to sell their product to other countries, unless 800.000 Gulden were paid for the exclusive rights. In case of differences between the parties the Austrian War Minister Feldzeugmeister Freiherr von John would head a commission consisting of the Vice-Admirals von Fautz and von Tegetthoff and Fieldmarshall-Lieutenants Möring and von Wurmb to settle any possible problems.

In July the Navy commission begun in Fiume the further tests with good results. It consisted of Contre-Admiral Alfons Wissiak, Linienschiffs-Capitän Rudolf Dufwa, Corvetten-Capitän Adolf Nölting, Linienschiffs-Lieutenants Julius Steiskal and Ernst Jacobi, Lieutenant Michael Sikić, Schiffbau-Oberingenieur Jakob Bredegard Andressen and Schiffbau-Ingenieur Heinrich Margutti.

Gunboat GEMSE was chosen for fitting the torpedo tube at the shipyard headed by Whitehead and by September 2, 1867 it was commissioned under the command of Linienschiffs-Fähnrich (Lieutenant) Georg Graf Hoyos.

GEMSE was fitted with a launch tube in the bow one meter below the water surface. During the first tests in October 1867 it was found out that the torpedo had to be pushed out of the tube and on October 30 the prototype torpedo was lost during a test run in the evening.¹¹

The second torpedo was ready on February 7, 1868, but on February 19 the tests had to be interrupted as the depth-regulator was not reliable enough.

⁹ Braun Theodor, *Die Kindheit des fünfundsiebzigjährigen Torpedos*, states the tests started on December 26

¹⁰ Gray, page 51

¹¹ Eventually this first torpedo was found by fishermen 18 months later and returned to Whitehead

Whitehead was able to solve the problems until March 13 and the following 30 test runs from the GEMSE against the yacht FANTASIE, which had a net under the keel, at a distance of 600 m brought 16 hits. In the second test series GEMSE was in motion during the launches and out of six runs two hits were achieved. During the third series both vessels were in motion and from three runs at 180 m two passed close in front of the bow and one was a hit, passing FANTASIE in the centre.

At that time the new 40 cm torpedo became available and out of 29 test runs against FANTASIE in 600 m distance 12 were hits. Since the depth-regulator was fitted with the control-pendulum, the depth control was sufficient.

On May 11, 1868 the Austrian Navy commission proposed that the new torpedo should be purchased with all rights and for the exclusively use of the Austrian Navy. Under the leadership of Vice-Admiral Wilhelm von Tegetthoff the navy board in Vienna believed that the invention of the torpedo could not be kept secret on the long run and was also short in the budget to add another 600.000 Gulden and therefor decided to go for the licence from Whitehead-Luppis for 200.000 Gulden.

This was in hindsight a good decision for both the Austrian Navy and Fiume as the Torpedo Factory was able to draw also foreign business and stayed a centre of excellence for the torpedo for the next half century.

THE INTERNATIONAL RACE FOR THE TORPEDO

The Austrian Navy bought a licence for the Whitehead torpedo for 200.000 Gulden and the 35 cm torpedo stayed onboard the GEMSE for further experiments in Summer 1868. With August 28, 1868 both experimental torpedos were transferred to the Austrian Navy.

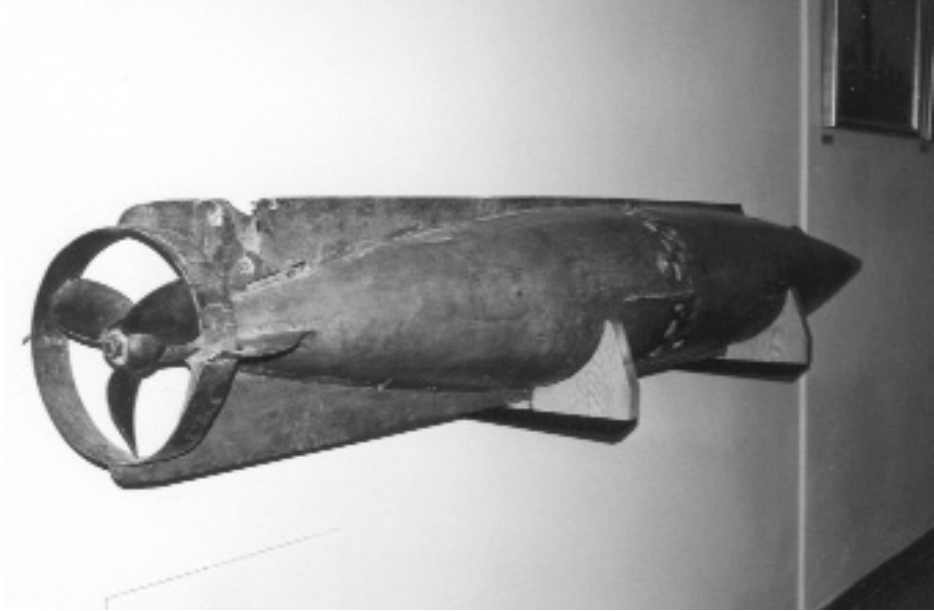
Once the contract was signed between Austria-Hungary and Whitehead-Luppis they were free to contact foreign powers.

Therefore they offered the torpedo to the British Admiralty and at the same time started to build two more 35 cm torpedos. With improvements in propulsion and steering these torpedos had a weight of 270 kg, an explosive charge of 10 kg and on 300 m distance a speed of 11 knots was achieved.

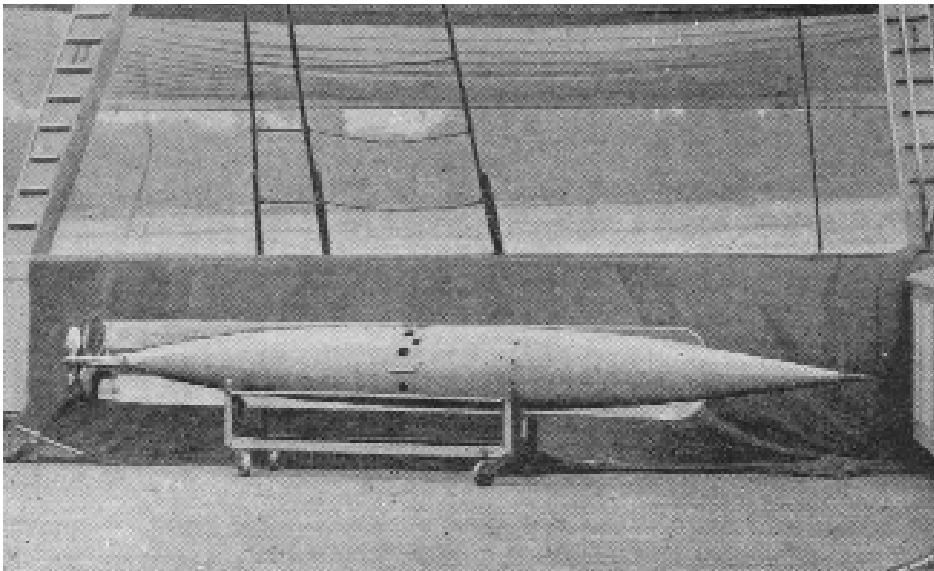
In August 1868 the British ambassador in Vienna, Lord Bloomfield and Admiral Lord Clarence Paget visited Robert Whitehead in Fiume to obtain information on the invention.

The French Capitaine de Frégate Lefort came shortly afterwards.

At that time all negotiations with foreign powers were put on halt by Whitehead as he was negotiating a new contract with Luppis. This new agreement secured Luppis a certain proportion of each new sale, but gave Whitehead all rights in respect to future negotiations and the technical development of the torpedo.



Model of the first Whitehead torpedo in the Austrian Army Museum in Vienna



Early 16 inch torpedo delivered to the British Navy

Austria-Hungary ordered in April 1869 four new torpedos and an underwater launch apparatus for the new torpedo school ship gunboat SEEHUND.

During 1869 Whitehead offered the torpedo also to the USA¹² and in August 1869 three British officers arrived in Fiume and were impressed by the new weapon.

The USA turned down the offer of Whitehead for 75.000 US Dollars.¹³

In October 1869 Whitehead first presented his torpedo in England and again in July 1870 he in company of Ploech and one technician he went there.

The tests were conducted at Sheerness and after several runs Whitehead launched from an adapted rowing boat a live torpedo against the hulk AIGLE. The AIGLE was hit at a distance of 180 m and sank.

The British Commission now voted for the purchase of the invention which took place on February 23, 1871.

As the Austrian-Hungarian the British considered to buy the exclusive rights from Whitehead beside Austria-Hungary but opted then for a licence.

France bought a licence in 1872, Italy and Germany in 1873, Norway, Denmark and Sweden in 1875, Turkey and Russia in 1876, Portugal, Argentina, Belgium, Chile and Greece in 1877.

The last major powers were Japan, China and the United States of America as late as in 1892.

When Germany bought the licence it insisted that the speed of the torpedo had to be brought to 16 knots at 550 m distance. Within a year the new torpedo produced for Germany achieved 17 knots at a distance 760 m. The German government was satisfied with the good results and went for a contract for 10 years ordering 100 torpedos. The earnings from this contract enabled Whitehead to buy the establishment "Stabilimento Tecnico Fiumano" in Fiume/Rijeka.

Soon afterwards Germany established the torpedo factory Schwartzkopff in Berlin which manufactured Whitehead torpedos out of bronze. This factory became step a competitor to the Whitehead torpedo factory and supplied also Brazil, China, Japan, Spain and Italy with the weapon.

Grey states¹⁴ that during a visit of the German engineer Louis Schwartzkopff in Fiume a set of drawings was stolen out of the Whitehead office. It was for sure that Schwartzkopff was not the thief but nevertheless within a year he started to produce copies of the Whitehead torpedo in bronze. Whitehead and Hoyos concluded that the burglary was most probably the work of a foreign power, the

¹² Barber F. M., *Lecture on the Whitehead Torpedo*, U.S. Torpedo Station, November 20, 1874, page 7

¹³ Gerken Louis C., *Torpedo Technology*, Chula Vista 1989, page 11

¹⁴ Gray, page 94

suspected the USA or Russia. Definitely this chapter needs further historical research to bring more facts.

France had purchased a licence to manufacture Whitehead torpedos in Toulon.

Sweden send on April 9, 1875 Captain C.F. Ekerman to Fiume to negotiate a contract with Whitehead. Ekerman had success and the contract was signed on June 3, purchasing 50 torpedos for Sweden and Norway of the newest automatic submarine torpedo. The contract also included the manufacturing rights at a total cost of 260.000 Swedish Krona.

The USA turned down another offer of Whitehead to sell his invention for 40.000 US Dollars in 1873. Furthermore an employee of the British Woolwich Laboratory was also willing to turn over plans and specifications for the Whitehead torpedo in return for employment at the US Naval Torpedo Station in Newport. The plans were obtained, the employment was turned down.¹⁵ The US. Navy began to develop its own torpedo but in 1891/92 obtained a licence from Whitehead.

Giovanni Luppis got in 1869 his patent of nobility for his contribution to the torpedo and called himself "von Rammer" and died on January 11, 1875 in Milano in Italy.

By 1880 nearly 1.500 Whitehead torpedos had been sold to the following countries:

Great Britain 254; Russia 250; Germany 203; France 218; Austria-Hungary 100; Denmark 83; Greece 70; Italy 70; Portugal 50; Argentina 40; Belgium 40; Chile 26. Norway 26, Sweden 26.

US Author Louis C. Gerken stated: "*Whitehead achieved instant success with a novel weapon. The first experimental torpedo worked well and was being mass produced for export within four years: an enviable achievement for any new product development!*"

A Swedish book¹⁶ summarises on the other side of this new weapon: "*As often happens, Whitehead was subject to severe criticism in his own country. His invention was called "the Devil's device" or "the horrible torpedo". And the fact is that the torpedo was the most dreaded weapon of naval warfare until the explosion of the A-bomb in 1945.*"

¹⁵ Gerken Louis C., *Torpedo Technology*, Chula Vista 1989, page 11

¹⁶ Ellsén Jarl, *Swedish Torpedo 100 Years 1876-1976*, Katrineholm 1977, page 12

THE TORPEDO IN WAR

The first use of the new torpedo was without success:

On 29th May 1877 the British Cruiser SHAH launched a torpedo against the Peruvian coastal defence vessel HUASCAR off the coast of Peru but the torpedo missed.

In the night of 27/28th December 1877 two Russian torpedo boats attacked some Turkish ships in Batum but again no hits were made.

First success for the new weapon came in the night of 25/26th January 1878 when the Russian torpedoboats TSCHEMME and SINOPE sank the Turkish aviso INTIBAH with two torpedos.

During the civil war in Chile the torpedoboat LYNCH sank the armoured ship BIANCO ENCALADA on 23rd April 1891 in Caldera Bay. 225 seamen perished with the stricken vessel and this was the proof that the torpedo was a dangerous weapon against all ships, no matter of size.

From this time the torpedo was a major weapon in all naval engagements.

ABSTRACT

From 1870 the new “fish torpedo” developed by Robert Whitehead in Rijeka/Fiume had a major influence on the naval situation and within ten years all important navies had taken licences to use the Whitehead torpedo.

The Torpedo Factory in Rijeka was one of the leading research and production facilities until 1914 and the torpedo itself is still a major naval weapon in the 21st century.

In 1860 the Commander/Fregattenkapitän Giovanni/Johann B. Luppis, captain of the Austrian frigate BELLONA started his idea of a remote controlled mining boat for coastal defence. After his retirement he settled in his hometown Rijeka and in 1864 Giovanni de Ciotta, a businessman from Rijeka, brought him into a contract with the English Engineer Robert Whitehead, who was the director of the Stabilimento Tecnico Fiumano.

Whitehead developed the automotive fish torpedo and on 20th December 1866 a successful torpedo launch on a distance of 370 m was demonstrated to an Austrian Naval Commission. The Austrian Navy bought a licence on the torpedo on 15th April 1867 and fitted the gunboat GEMSE with a torpedo tube. The tests were successful and in 1868 the Austrian Navy introduced the torpedo but lacked the financial budget to buy the sole rights of the new development and allowed Whitehead to sell licences also to other navies.

In 1869/70 Whitehead demonstrated his torpedo to the British Admiralty and in February 1871 sold a licence to Great Britain, which started to produce in licence

in their newly erected torpedo factory in Woolwich, which stayed in technical contact with the factory in Rijeka until 1914.

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Although all navies introduced constant improvements to their torpedos manufactured in licence the torpedo factory was one of the major development centres for the torpedo world-wide until 1914, when the First World War changed a lot.

In 1895 the Austrian Naval technician Ludwig Obry developed the gyro for the torpedo, which solved the problem of steering the direction properly. This helped again to give the Whitehead factory in Rijeka an important technical advantage.

The paper concentrates on the development of the torpedo in Rijeka in the 19th century and the introduction in all major navies.

Sources for the paper are from Austria, Italy, Great Britain and USA.

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Sažetak

RAZVOJ WHITEHEADOVA TORPEDA U RIJECI I UTJECAJ NA SVJETSKE MORNARICE

Nikolaus A. Sifferlinger

Od 1870. novi "torpedo-riba" koji je Robert Whitehead razvio u Rijeci/Fiume, imao je važan utjecaj na stanje na moru jer su sve značajne ratne mornarice kupovale licenciju za korištenje Whiteheadova torpeda.

Tvornica Torpedo Rijeka bila je jedna od vodećih istraživačkih i proizvodnih postrojenja do 1914., a sam torpedo još je i danas, u 21. stoljeću, glavno oružje na moru.

Godine 1860. zapovjednik/kapetan fregate Johann B. Luppis, kapetan austrijske fregate Bellona započeo je s ostvarenjem svoje zamisli o daljinski upravljivom "brodu-mini" za obranu obale. Nakon umirovljenja nastanio se u rodnom gradu Rijeci, a 1864. godine Giovanni de Ciotta, poslovni čovjek iz Rijeke, povezo ga je s engleskim inženjerom Robertom Whiteheadom, direktorom brodogradilišta Stabilimento Tecnico Fiumano.

Whitehead je razvio samopogonjen torpedo u obliku ribe, a 20. prosinca 1866. uspješno je lansirao torpedo na duljinu od 370 m pred austrijskom Pomorskom komisijom. Austrijska ratna mornarica kupila je licenciju za torpedo 15. travnja 1867. i postavila torpednu cijev na topovnjaču Gemse. Pokusi su uspješno prošli, a 1868. austrijska ratna mornarica uvela je torpedo, ali nije predvidjela financijska sredstva za kupnju isključiva prava za korištenje novog izuma, i tako dopustila Whiteheadu da prodaje licenciju i drugim ratnim mornaricama. Godine 1869./1870. Whitehead je svoj torpedo pokazao britanskom Admiraltetu, a u veljači 1871. prodao je licenciju Velikoj Britaniji koja je započela licencnu proizvodnju u novouređenoj tvornici torpeda u Woolwichu koja je do 1914. bila u stalnome tehničkom kontaktu s tvornicom u Rijeci.

Francuska je kupila licenciju 1872., Italija i Njemačka 1873., Norveška, Danska i Švedska 1875., Turska i Rusija 1876., Portugal, Argentina, Belgija, Čile i Grčka 1877. Posljednje velesile koje su kupile licenciju bile su Japan, Kina i Sjedinjene Američke Države.

Prva primjena novog torpeda bila je neuspješna.

Dana 29. svibnja 1877. britanski krstaš Shah lansirao je torpedo na peruanski brod za zaštitu obale Huascar ispred obale Perua, ali torpedo je promašio cilj.

U noći 27./28. prosinca 1877. dva ruska torpedna čamca napala su turske brodove u Batumu, ali opet nije bilo pogodaka.

Prvi uspjeh za novo oružje dogodio se u noći 25./26. siječnja 1878. kada su ruski torpedni čamci Tschesme i Sinope s dva torpeda potopili turski mali ratni brod Intibah.

Za vrijeme građanskog rata u Čileu torpedni čamac Lynch potopio je oklopni brod Bianco Encalada 23. travnja 1891. u zaljevu Caldera. S pogodenim brodom poginulo je i potonulo 225 mornara, što je bio dokaz da je torpedo opasno oružje za sve brodove, bez obzira na njihovu veličinu. Otada je torpedo postao glavnim oružjem u svim ratnim operacijama na moru.

Iako su sve ratne mornarice neprestano radile na usavršavanju njihovih torpeda proizvedenih po licenci, tvornica torpeda u Rijeci ostala je glavnim razvojnim centrom u svjetskim razmjerima do 1914. kada je Prvi svjetski rat štošta izmijenio.

Godine 1895. austrijski brodogradni tehničar Ludwig Obry razvio je žiroskop za torpedo, čime je riješen problem točnog usmjeravanja. Time je Whiteheadova tvornica u Rijeci ponovno dobila značajnu tehničku prednost.

Referat je usmjeren na razvoj torpeda u Rijeci u 19. stoljeću i njegovo uvođenje u sve važne ratne mornarice svijeta.

Korišteni su izvori iz Austrije, Italije, Velike Britanije i SAD-a.

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AND THE IMPACT TO THE WORLD NAVIES***Nikolaus A. Sifferlinger*

From 1870 the new "fish torpedo" developed by Robert Whitehead in Rijeka/Fiume had a major influence on the naval situation and within ten years all important navies had taken licences to use the Whitehead torpedo.

The Torpedo Factory in Rijeka was one of the leading research and production facilities until 1914 and the torpedo itself is still a major naval weapon in the 21st century.

In 1860 the Commander/Fregattenkapitän Johann B. Luppis, captain of the Austrian frigate BELLONA started his idea of a remote controlled mining boat for coastal defence. After his retirement he settled in his hometown Rijeka and in 1864 Giovanni de Ciotta, a businessman from Rijeka, brought him into a contract with the English Engineer Robert Whitehead, who was the director of the Stabilimento Tecnico Fiumano.

Whitehead developed the automotive fish torpedo and on 20th December 1866 a successful torpedo launch on a distance of 370 m was demonstrated to an Austrian Naval Commission. The Austrian Navy bought a licence on the torpedo on 15th April 1867 and fitted the gunboat GEMSE with a torpedo tube. The tests were successful and in 1868 the Austrian Navy introduced the torpedo but lacked the financial budget to buy the sole rights of the new development and allowed Whitehead to sell licences also to other navies.

In 1869/70 Whitehead demonstrated his torpedo to the British Admiralty and in February 1871 sold a licence to Great Britain, which started to produce in licence in their newly erected torpedo factory in Woolwich, which stayed in technical contact with the factory in Rijeka until 1914.

France bought a licence in 1872, Italy and Germany in 1873, Norway, Denmark and Sweden in 1875, Turkey and Russia in 1876, Portugal, Argentina, Belgium, Chile and Greece in 1877.

The last major powers were Japan, China and the United States of America.

The first use of the new torpedo was without success:

On 29th May 1877 the British Cruiser SHAH launched a torpedo against the Peruvian coastal defence vessel HUASCAR off the coast of Peru but the torpedo missed.

In the night of 27/28th December 1877 two Russian torpedoboats attacked some Turkish ships in Batum but again no hits were made.

First success for the new weapon came in the night of 25/26th January 1878 when the Russian torpedoboats TSCHESME and SINOPE sank the Turkish aviso INTIBAH with two torpedos. During the civil war in Chile the torpedoboat LYNCH sank the armoured ship BLANCO ENCALADA on 23rd April 1891 in Caldera Bay. 225 seamen perished with the stricken vessel and this was the proof that the torpedo was a dangerous weapon against all ships, no matter of size.

From this time the torpedo was a major weapon in all naval engagements.

Although all navies introduced constant improvements to their torpedos manufactured in licence the torpedo factory was one of the major development centers for the torpedo world-wide until 1914, when the First World War changed a lot.

In 1895 the Austrian Naval technician Ludwig Obry developed the gyro for the torpedo, which solved the problem of steering the direction properly. This helped again to give the Whitehead factory in Rijeka an important technical advantage.

The paper concentrates on the development of the torpedo in Rijeka in the 19th century and the introduction in all major navies.