

“Viribus Unitis” An Austro-Hungarian battleship sunk by frogmen during WW1. Old Postcard, unknown source.

During the first years of World War II Italian frogmen demonstrated to the world how effective a weapon a frogman could be. Hidden by the water, these frogmen mined the Allies’ ships as they were moored ‘safely’ in their own waters.



in their harbours, surrounded by mine-fields and anti-submarine nets. This passivity was, in the main, due to the ongoing submarine war.

In 1915, after Italy had severed its connections with its German and Austrian allies, and joined the English-French Alliance, Italian naval officers had thought long and hard about how the Austro-Hungarian fleet could be attacked in the harbour.



The First Frogmen

By Sven Erik Jørgensen - The Danish Society of Diving History



Even with quite small numbers, and using relatively small resources, the frogmen were a very powerful force. The English, especially, were quick to copy the equipment and train their own frogmen, and after the war many nations supplemented their armed forces with frogmen units.

The idea of such a weapon arose in World War I, when experiments were carried out using different vessels to carry mines into the Austro-Hungarian naval base in Pola. The weapon was developed during the inter-war years

1915

While the war was raging on the battlefields of Europe, and submarines were terrorising the ships on the high seas, the Austro-Hungarian fleet and Italian fleet lay mostly well protected

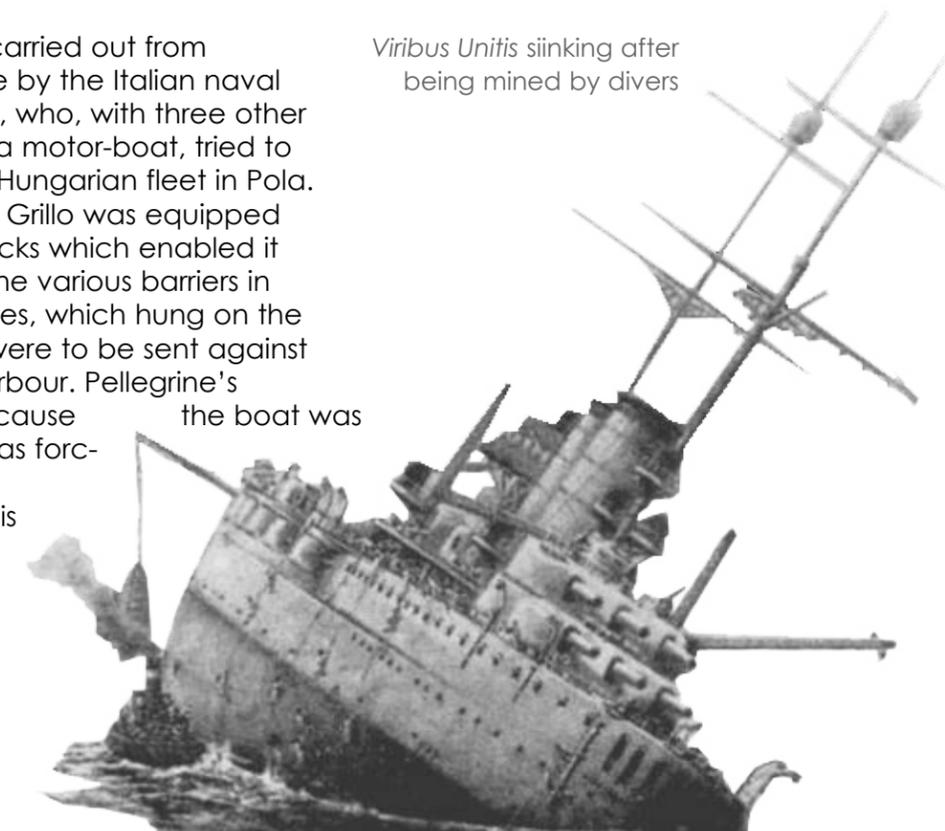
Two attack divers astride a SLC - Siluro a Lenta Corsa (slowly moving torpedo)

The first attempt, carried out from Venice, was made by the Italian naval captain Pellegrine, who, with three other crew members in a motor-boat, tried to attack the Austro-Hungarian fleet in Pola.

Pellegrine's boat Grillo was equipped with caterpillar tracks which enabled it to crawl up over the various barriers in Pola. Two torpedoes, which hung on the side of the boat, were to be sent against the ships in the harbour. Pellegrine's attempt failed because the boat was discovered as it was forcing a barrier.

Pellegrine and his crew spent the rest of the war in captivity.

Viribus Unitis sinking after being mined by divers





Naval-lieutenant
Raffaele Paolucci

Pola, or Pula, lies at the tip of the peninsula of Istria, now in Croatia, at the top of the Adriatic sea

1918 whereby he was to be transported by motorboat to about a sea-mile out of Pola. From here he would swim into the harbour towing a mine.

Under one of the battleships he would tie a four meter-long rope to the mine and thereafter sink it by letting the air out of its two floatation tanks. The other end of the rope was to be fixed to the hull of the ship.

The mine, which contained about 100 kg of TNT, had an automatic timer, and would explode in about 4 meters of water close to the side of the ship. As soon as the mine was activated Paolucci would

swim out of the harbour towards the outer breakwater and wait for the explosion. He would then swim out to sea and, with his back to the enemy, signal to the motorboat to pick him up.

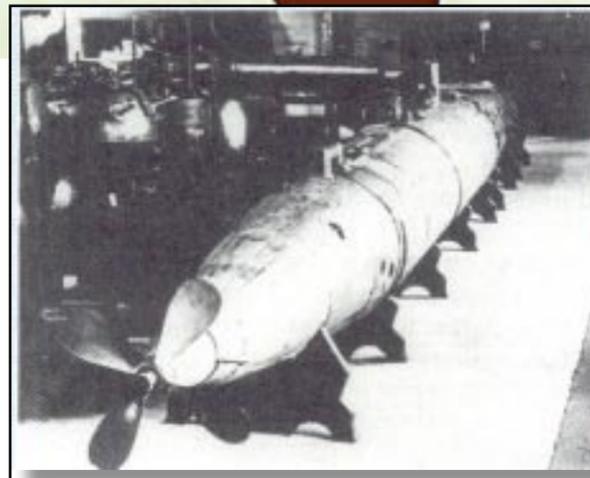
Mignatta

After months of nocturnal swimming near Venice, towing a mock-up of the mine, he abandoned the project.

Simultaneously with the efforts of Paolucci, Italian engineer and naval officer Raffaele Rossetti was working on a modified com-



Mignatta, a compressed air minisub for carrying divers

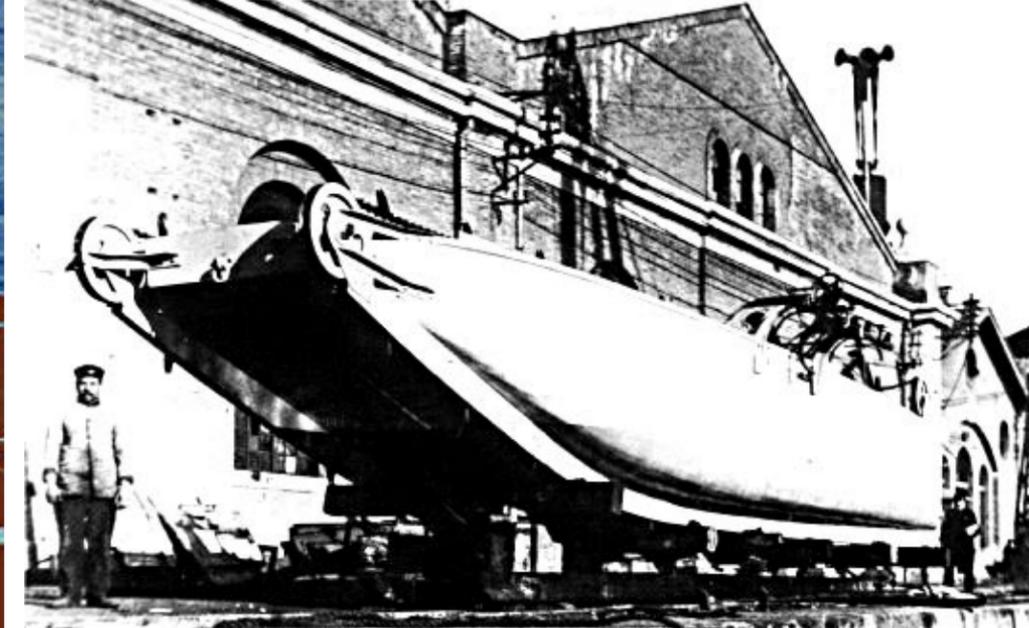


pressed-air torpedo, named *Mignatta*, which, half-submerged, would carry him and another crew member into Pola. The men, in diving suits, would sit astride the torpedo and steer it into the harbour and thereafter over to one of the battleships. Two mines, each of 170 kg TNT, were fixed to the head of the torpedo. The mines were to be hung in a 4 meter-long rope under one of the battleships. Rosetti had constructed a powerful magnet which should keep the rope fixed to the side of the ship.

ready for action. Two models of Mignatta were built, S1 and S2.

Now or never

However, in October 1918, an armistice was in the offing, and it was obvious that it was now or never if the Mignatta was to see action. In the evening of 31 October, 1918, a motortorpedo boat from Venice set sail for Pola. On board were Paolucci and Rossetti and, on the deck, the S2 and a motorboat which would carry the two men and the



Pellegine's boat Grillo was equipped with caterpillar tracks which enabled it to crawl up over the various barriers in Pola

Captain Constanzo Ciano had been watching the efforts of the two men, and asked them to cooperate with him in completing the project with Mignatta. This cooperation soon proved to be effective, and after several tests and modifications Mignatta was

Mignatta close in to Pola. At 22.13 the S2 was released from the motorboat and sailed in to Pola, which was reached at 02.00 on 1 November, 1918. In the harbour the two men passed three anti-submarine nets by pulling the S2 over them.

Once inside the harbour they steered in between two illuminated battleships and directly towards the 21000 ton battleship *Viribus Unitis*. They fixed one of the mines and then rapidly sailed away – leaving a trail of silvery bubbles.

On their course away from the battleship they were discovered, but before being taken prisoner they had managed to arm the second mine, and then left the Mignatta to its own devices. It wandered around in the harbour, and when the compressed-air was exhausted it finally came to rest against one of the ships.

War's over - well almost

That they were not discovered before was due to the fact that it was a day

Targetting Pola

The desire to hit the Austro-Hungarian fleet in Pola was, however, undiminished, and much thought was put into possible solutions. Naval-lieutenant Raffaele Paolucci worked out a plan in

Limpret mine being fixed to the bottom of a vessel



Sideview of the Mignatta

Dive History



The only known picture of the *Viribus Unitis* sinking

of festivity in the harbour, where they were celebrating the capitulation of the Austro-Hungarian fleet, which had been handed over to the South Slavic National Council. However, Paolucci and Rossetti had no knowledge of this, and, at 06.20, the mine that was placed four meters under the waterline of the *Viribus Unitis* exploded. A quarter of an hour later the battleship rolled over and sank.

That it could go so completely wrong was due to the fact that there was

thought to be no reason to keep the watertight doors closed. Immediately after this first explosion a second explosion was heard. It was the second mine, still attached to the *Mignatta*, that exploded directly against the side of the 7000 ton freighter *Wien*, and sent her to the bottom. Ten days after *Viribus Unitis* had been sunk Germany accepted the Armistice conditions, and World War I was brought to a close.

New weaponry

The attack at Pola was a success – the Italian fleet had obtained insight into a new weapon. The weaknesses of the weapon were that the crew were visible above the surface of the water, and that the compressed-air torpedo sent out a stream of air-bubbles. These deficiencies would have to be corrected so that an attack could be carried out with the torpedo and crew completely submerged, and without air-bubbles giving evidence of the attack.

The interwar years

In the inter-war years another alliance was formed, an alliance in which Italy was not allied with England. Italy felt itself squeezed between the English fleet in Alexandria and the French fleet in Toulon. That England could rapidly reinforce their Mediterranean fleet with units from their Atlantic fleet didn't make the Italian frustrations any the less. Italy needed a weapon that could reduce the scope of a possible blockade.

The First Frogmen

It was two Italian divers and naval officers, Teseo Tesei and Elios Toschi, inspired by Rossetti's *Mignatta*, who would begin the development of the weapon that the world would come to know as "Frogmen". However, before this weapon could be brought into service, diving suits, breathing apparatus and 'torpedoes' had to be developed.

Divers preparing a limpet mine before a mission



Further developments

Teschi and Tesei served as engineers for the submarines at the naval base at La Spezia. The development and construction of an improved *Mignatta* started in 1935, and in January two prototypes were tested. Later in the year the new weapon was demonstrated, under the strictest secrecy, for the Admiralty in a dock at the La Spezia basin.

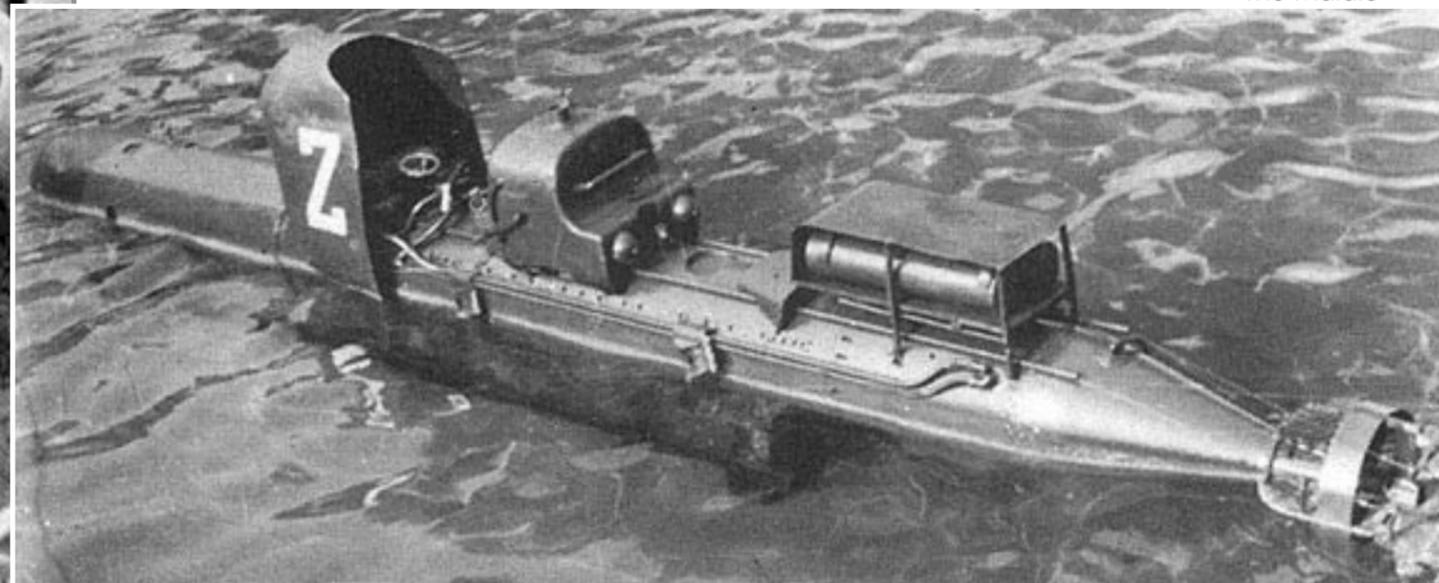
The Maiale

The weapon mostly resembled a torpedo but was in fact a miniature submarine designated SLC (*Siluro a Lenta Corsa*) with the nickname *Maiale* (the pig). The torpedo was 7.3 m long, including the explosive head, the diameter was 0.53 m, and two frogmen could sit astride it. The compressed-air motor had been replaced by a 1.1 HP electric motor. The power of the motor was later increased to 1.6 HP. In 1935 the explosive weighed 220 kg, but was later increased to 250 kg and thereafter to two amounts of explosive, each of 150 kg. The capacity of the batteries allowed a voyage of 5 seamiles at 2.3 knots or 4 seamiles at 4.5 knots. The torpedo had diving tanks

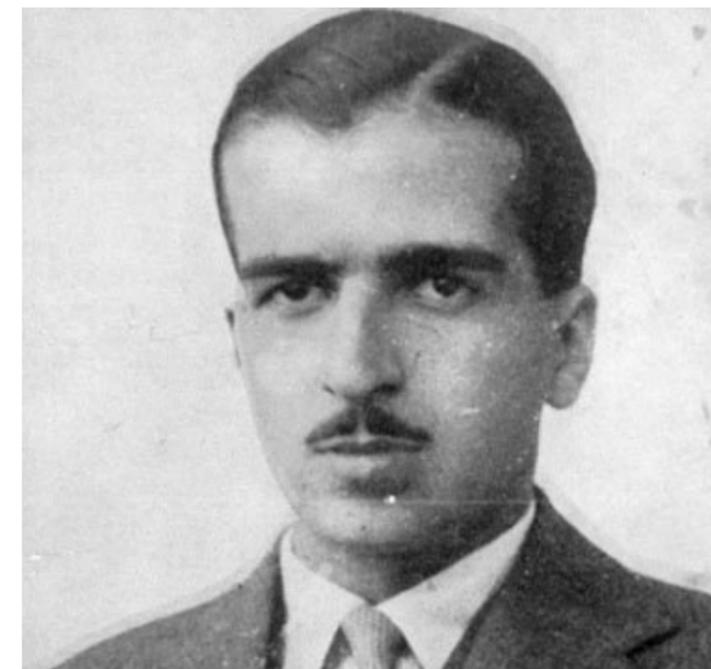
which permitted the crew to increase or decrease the buoyancy. A separate compartment contained compressed-air tools to cut through a submarine net. A screen in front of the leading frogman protected the crew against the water flow. Behind the screen were the steering controls and the luminous navigation equipment. The maximum diving depth was 40 meters.

The crew wore waterproof Belloni suits (*Vestito Belloni*) constructed by Captain Belloni. The Belloni suit actually consisted of two suits, an inner suit of thin elastic rubber, and an outer suit of heavy can-

The *Maiale*



Italian naval officer Teseo Tesei was one of the developers of a new branch of underwater weapon





The Belloni suit. Picture electronically enhanced from bad original

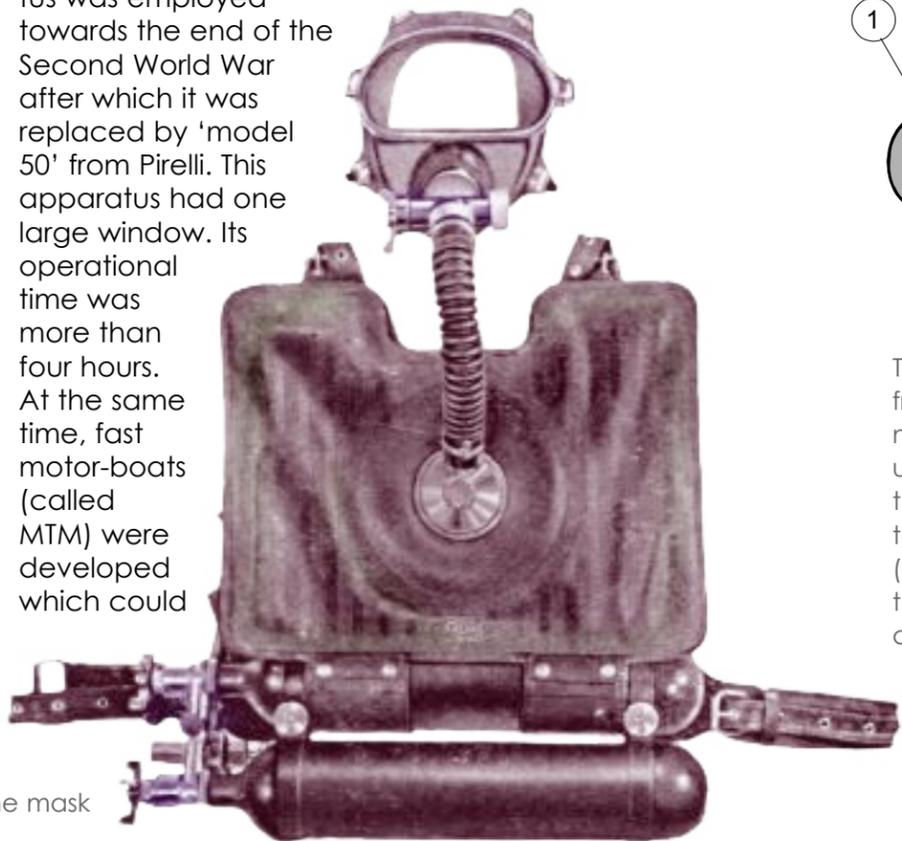
vas. The suits collectively comprised a single unit. When worn, the inner suit could only be seen at the wrists of the frogman where the cuffs ensured a close watertight fit, and at the throat where there was also a close watertight fit. In the middle of the stomach there was a buttoned flap in the outer suit. This flap covered the opening to the inner suit. The opening was a round tube of thin rubber which emerged perpendicularly from the inner suit around the stomach of the frogman. This tube was nicknamed 'the kangaroo'. When the frogman was dressed the tube was twisted together to

a watertight closure and hidden behind the flap in the outer suit. This suit was used by the Italian frogmen throughout the whole war. The English made similar suits, and the principle was employed in the first suits that were produced after the war.

Rebreathers

The breathing equipment that was required in order to sail completely submerged, was initially a modified Davis jacket – an ascent jacket designed for submarine crews. The equipment had a closed-circuit system with manual control of the oxygen, and a potassium cartridge to absorb the carbon-dioxide. Captain Belloni mounted a helmet with two windows onto the equipment and modified it with bigger chalk containers and a bigger oxygen supply, thereby obtaining a greater operational time. Later, a Pirelli daughter-company produced an oxygen apparatus 'model 49' for the unit. Dosing of the oxygen was now continuous, so that the frogmen did not have to keep filling oxygen into the breathing-bags. Model 49 was replaced in 1936 by Model 49/bis. This apparatus was employed

towards the end of the Second World War after which it was replaced by 'model 50' from Pirelli. This apparatus had one large window. Its operational time was more than four hours. At the same time, fast motor-boats (called MTM) were developed which could



The later version, Salvus, of the early adapted ascent jacket turned CCR rebreather. This version has only one window in the mask

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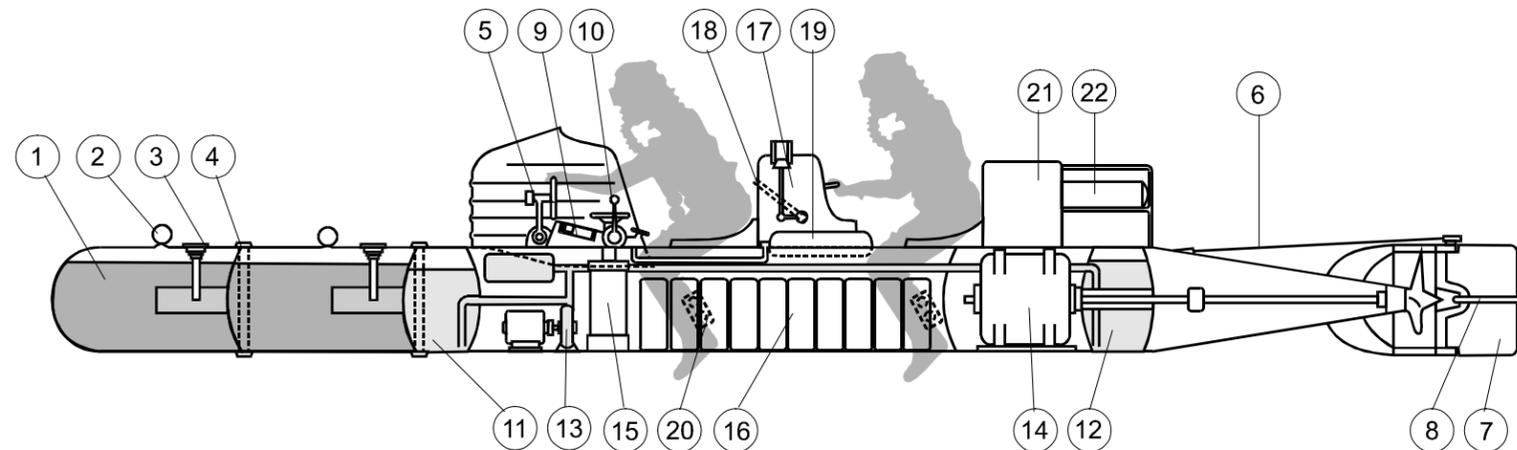
be steered towards enemy ships.

The boat carried a 300 kg explosive charge which detonated on contact with the objective. At an appropriate distance from the target the rudder was to be fixed and the crewman to abandon the boat, which would then continue at

a high speed towards the target.

The training of the crew started with great enthusiasm, but not everyone was convinced of the effectivity of the new weapon – what could two men accomplish against a battleship? Political

opinions regarding the weapons were so strongly diverse that it was necessary to terminate the project, and the torpedoes, equipment and boats at the naval base in La Spezia were hidden well away from curious eyes.



The two mines (1) are fixed to the front. They are held onto the SLC by metalbuckles (4). The mines are hung under enemy ships by wires through the screw eyes (2) and the detonator mechanism (3) activated. 5. Tiller (steering rod), which are connected through wires (6) to rudder (7) and stabiliser (8) controlling the SLC. Console (9) with compass, depth gauge and libelle (measuring angle) Also in same console there is a voltmeter and amperemeter

indicating the engines load and consumption.

10. Lever by which the pump 13 is operated controlling the buoyancy and trim by moving water between ballast tanks (11) and (12). The revolutions of the engine (14) can be controlled by a wheel over the regulator (15) which controls the supply from the batteries (16). Between the frogmen there is a container of air for buoyancy while sailing at the surface (17). In case a rapid descent is desired a valve

(18) is opened whereby the SLC dives. For surfacing the buoyancy can be restored with air from the tank of pressurised air (19).

The frogmen who are subject to a considerable force from the water while sailing are protected by a "windshield" and their legs are held into position by stirrups (20). At the rear there is another buoyancy tank (21) compensating for the weight of the engine and a toolbox (22) with wirecutters, clamps etc.

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1938

In 1938 commander Paolo Aloisi was promoted to head of the First Light Flotilla, which consisted of very fast boats. The Ministry also asked Aloisi to take over the torpedos as well as the MTM-boats. Aloisi quickly saw the possibilities in these weapons, and under his leadership both Maiale and the MTM-boats underwent several improvements.

In July 1939 the political situation in Europe was such that it was obvious that a war was imminent. As a consequence of this, the Naval authorities asked Aloisi to accelerate the development of the weapons and begin the training of the crews. The earlier pilots were transferred to the First Light Flotilla together with the new trainees. The carefully selected crew undertook a hard physical training as well as a thorough mental training.

The elite

Only the absolutely most suitable were accepted. Those that were found not to be suitable were returned to their previous unit with a diving certificate.

The early breathing apparatus model 49/bis - this one with the two windows in the mask

Free-swimming frogmen were also trained, these being designed Gamma-men. Their equipment was modified in several ways in order to make it easier for them move under their own power. The suits were tight-fitting, and they had fins on their feet. The oxygen equipment had a smaller oxygen-cylinder with consequently a shorter operation time. The underwater operation time for the Gamma-men was about 40 minutes. The Gamma-men were trained to cover a distance of 6 – 7 km at a speed of more than 1.5 km per hour. The oxygen equipment was only to be used when they were close to the objective. As camouflage the Gamma-men had a net with seaweed over their heads. It was intended that the Gamma-men should be brought close to the objective by submarine or fast motorboat, or that they should operate from a neutral coast.

Minelaying

Two types of mine were developed, which the Gamma-men could carry around their necks or in a belt. 'Leech' was a mine with 2 kg of explosive. The mine was held under the ship by means of an inflated rubber bladder which held the mine against the bottom of the ship. When the mine had been placed the Gamma-man activated a detonator which detonated the mine after a given interval.

The other type of mine, the 'Limpet', contained 4.5 kg of explosive, and was fixed to the keel by means of a clamp. The detonation of this mine was arranged so that it would sink the vessel out in the open sea. The point at which the mine would explode was controlled by a



Professor Luigi Ferraro, founder of Technisub, was one of the select Gamma-men and Italian hero.

propeller on the mine. The propeller first began to turn when the speed of the ship was above 4 knots. After a given number of revolutions, which corresponded to a given sailed distance, the mine exploded. The ship was thus sunk where salvaging of the



ship and its cargo was impossible or more complicated than in harbour, and the suspicion of a frogman attack probably did not arise.

It was originally intended that the torpedoes should be launched from amphibious aircraft, but it was the submarines that were given the job. Several submarines had airtight containers fixed to their decks, each of which could hold a torpedo. The containers were intended to protect the torpedoes from damage from depth-bombs and from damage if the submarines were forced down into deeper water.

In containers on a sub

The submarine crew could either open the containers while the submarine lay awash at the surface, or they could exit from the submarine while it lay on the bottom and thereafter open the containers, pull the torpedoes out and start the operation. Both forms of launch were trained.

Attempts were made with short-wave radios with which the crew could find their way back to the submarine after the operation had been carried out. The trials were not successful and were thereafter dropped. It was realised that it would not be possible to bring the torpedoes and crew back with the submarine. The crew had to find a neutral coast and drop the torpedoes there. That the crew didn't have to worry about getting back to the submarine would give them greater motivation for the operation.

The first practice attacks were carried out at the begin-

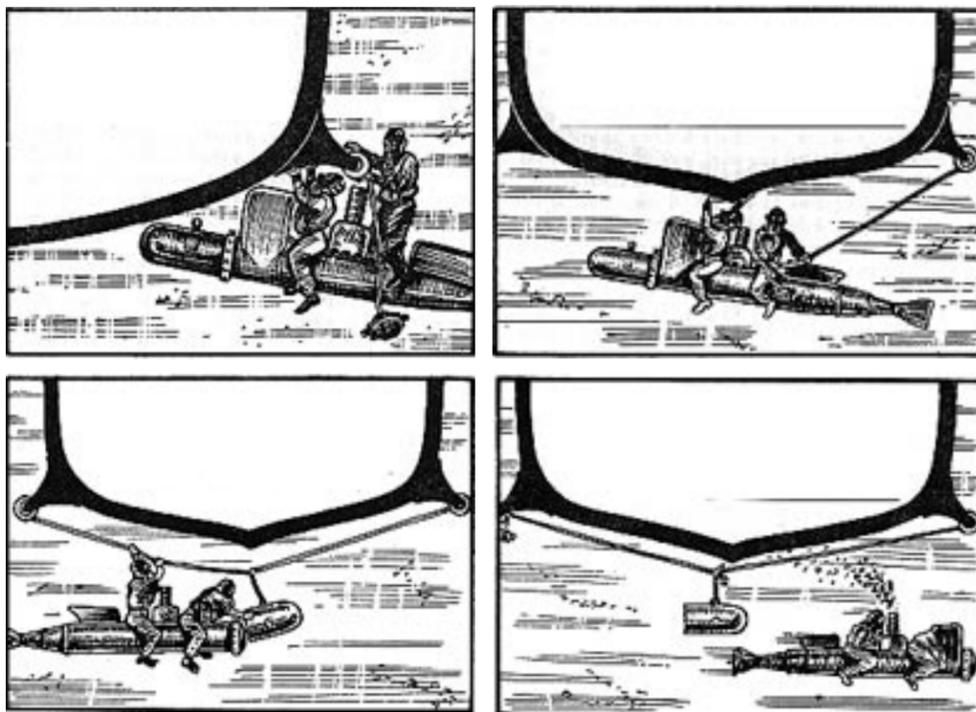


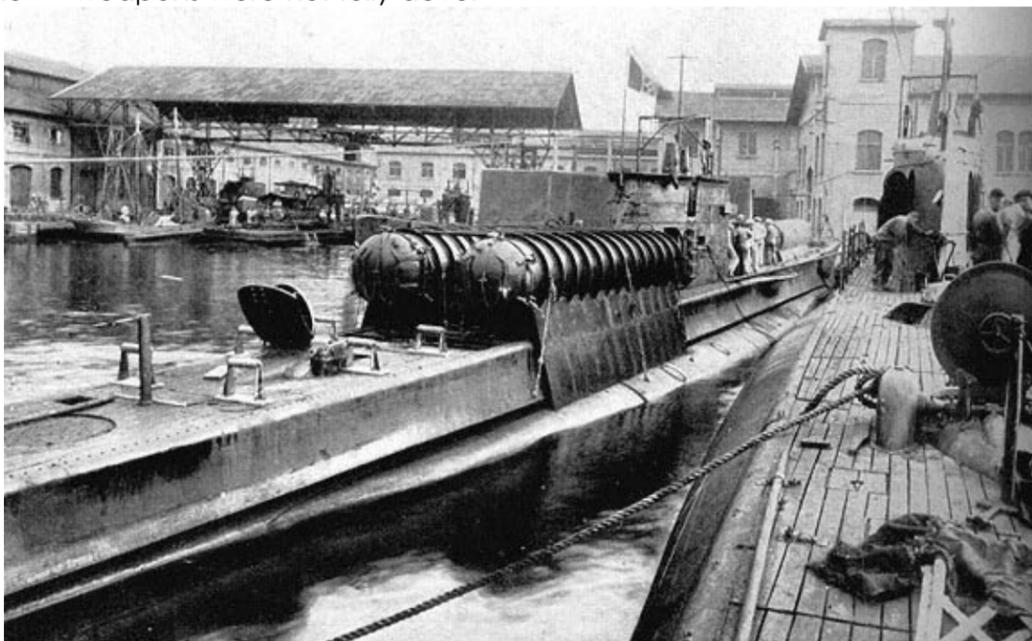
Illustration of laying a mine under an enemy ship. From the Italian Ministry of Defence. See maintext for explanation

ning of 1940. The objective was the cruiser Quarto which was anchored in the bay outside La Spezia. Three Maiales took part in the exercise, two of them broke down and couldn't complete the exercise, but the third managed to place a dummy mine under Quarto.

A two-year break in the work on the weapons and in the training of the crew meant that the weapons were not fully devel-

oped when Italy declared war on England on 10 June 1940. The first attack with Maiale should have taken place on the night between the 25 and 26 August 1940 against the English warships in the bay of Alexandria – but things turned out quite differently from what the Italians had hoped.

To be continued in our next issue



Italian Submarine Scire in the port of La Spezia with containers for two SLCs mounted on her deck

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