

Type 214TN REIS Class & Submarine Capabilities in the Eastern Mediterranean

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Unlike the surface combatants that can move and perform evasive maneuvers only in two dimensions, the submarine is a strategically important naval platform that can operate and carry out independent operations in a three-dimensional environment without any external support even in enemy-controlled waters with its silent, hidden, and surprising features.

The Hybrid powered Type 214TN REIS Class Submarines, which constitute one of the significant turning points in the Turkish submarine history which spans 134

years, has a quieter hull design, reduced flow noise as well as a lower acoustic, thermal and magnetic signature compared to the diesel/electric propelled diesel/electric powered AY (Type 209/1200), PREVEZE (Type 209/1400) and GÜR Class (Type 209/1400-Mod) Submarines in the inventory of the Turkish Naval Forces Submarine Group Command. Moreover, thanks to their PEM Fuel Cell (2x120kw) based an Air Independent Propulsion (AIP) System and high capacity batteries (2x324 units), they can conduct long-endurance operations (from 4 days to 3 weeks) without the need for snorkeling. With its superior features such as the ability to cross the Mediterranean underwater without snorkeling and sailing to the USA without refueling, REIS Class Submarines



further enhance the operational activities and capabilities of the Turkish Naval Forces in the surrounding seas, especially in the Aegean and the Eastern Mediterranean.

The Submarine Group Command, which commands the strategic, silent, and hidden weapons of the Turkish Naval Forces, continues its activities in line with the mission of protecting the maritime relevance and interests of our country in the Blue Homeland exercise which covers 462,000 km². By 2025, the Submarine Group Command is envisaged to have 2 AY Class submarines, 4 PREVEZE Class submarines (Two of them have been modernized as part of the Mid-Life Upgrade program, and the other two are in the

modernization process. Under the MLU program, the submarines are equipped with the HENSOLDT products; new Navigation and Attack periscopes, locally produced sonar, ESM and MÜREN CMS systems, and AKYA National Heavyweight Torpedoes), 4 GÜR Class submarines, and 4 REIS Class submarines (Two more Type 214TN submarines will be under construction and expected to undergo Sea Acceptance Tests/SAT).

In recent years, the ongoing drilling activities in the East Mediterranean have pit Turkey against Greece, Israel, and Egypt. Having sovereignty rights both in the Aegean and in the Eastern Mediterranean region, Turkey has repeatedly declared that it will not allow a fait accompli in these regions.



The tension between Turkey and these three countries has increased even more with the signing of an agreement between Turkey and Libya, aiming to create an Exclusive Economic Zone (EEZ) in the region from the southern Mediterranean shores of Turkey to the northeast coast of Libya. With this agreement, our country also disrupted the plans of Southern Cyprus, Greece, Israel, and Egypt to lay claim to the natural gas reserves in the eastern part of the Mediterranean Sea and also blocked the pipeline project, which will extend from Israel to Southern Cyprus waters, from the island of Crete to Mainland Greece and from there to the European natural gas network via Italy. Greece, Israel, and Egypt, which are currently in conflict with Turkey in the Aegean and Eastern Mediterranean regarding research and sharing of natural gas resources, are among the prominent countries with strong naval presence and submarine force in the region. Another submarine power in the region is Algeria, which has 4 Improved Kilo Class (Project 636) and 2 Kilo Class (Project 877EKM) submarines supplied from the Russian Federation.

Although Israel and Egypt are not at the level and capacity to compete with the Turkish Navy in terms of submarine strength and effectiveness, the Israeli Navy Submarine Flotilla Shayetet 7 (7th Flotilla), albeit it has a small number of submarines, is one of the most effective and qualified submarine forces in the Eastern



Mediterranean with the support of the technical and technological possibilities and capabilities of the Israel Defense Industry and considered as a serious competitor to the Turkish Naval Forces Submarine Group Command.

In addition to 3 Type 209/1100 and 3 Type 209/1200 Class diesel/electric propelled submarines, the Greek Navy operates 1 Type 209/1500 and 4 Type 214HN AIP Submarines. The Egyptian Navy has 4 modernized Romeo Class (Chinese Type 033 Class, 831, 842, 852 and 858) submarines

and 4 Type 209/1400-Mod diesel/electric propelled submarines, two of which have been delivered (S41/861 and S42/862), one in the Sea Acceptance Test (SAT) phase (S43/863) and one under construction (S44/864). Delivery of Type 209/1400-Mod Class Submarines is planned to be completed by the end of 2021. As of January 2020, Israel Navy Submarine Flotilla Shayetet 7 operates 3 diesel/electric propelled Dolphin-I Class Submarines and 2 Dolphin-II Class (also known as Dolphin AIP or Super Dolphin) Submarines. The

construction activities of the third Dolphin-II Class Submarine INS Dragon (formerly INS Dakar) continue in HDW Shipyard in Germany, and the submarine is expected to be launched in 2020.

The Romeo Class Submarines, with a surface displacement of 1,330 tons and a submerged displacement of 1,712 tons, entered the Egyptian Navy service in 1982-1984. Under the US\$133 million agreement signed on June 25, 1996, the submarines were modernized at Ras El Tin Naval Base in Alexandria, Egypt, by the main contractor Lockheed Martin Tactical





Egyptian 209/1400 Mod Type Submarine

Defense Systems. As part of the modernization activities completed in the early 2000s, the Romeo Class Submarines were equipped with Kollmorgen product Model 86 Optronic Mast (Surveillance) and Model 76 Attack Periscope, a new generation of active and passive sonar systems (Loral and STN Atlas product), a modern fire control system, a new type of navigation and communication systems and Condor System AR-700-S5 ESM (Electronic Support Measures) System. Featuring UGM-84 Submarine-launched Harpoon Guided Missiles (Encapsulated Harpoon) and NT-37F Heavyweight Torpedoes, Romeo Class Submarines usually carry 4 Harpoon Missiles and 10 torpedoes. During the naval exercise

conducted in December 2019, one of the Romeo Class Submarines (849) launched a Harpoon Missile from underwater, and the Egyptian Ministry of Defense shared the pictures on social media. Even though the Romeo Class Submarines are upgraded with modern sensors and Sub-Harpoon capability with the modernization program, I consider that in terms of operational performance, the Romeo Class Submarines cannot even compete with the modernized AY Class Submarines in the TNFC inventory. The Type 209/1400-Mod Submarines, the most modern submarines in the Egyptian Navy inventory, are the same platforms as the GÜR Class in the TNFC service and are similar in terms of sensor equipment

and weapon loadout.

The Egyptian Navy signed a €920 million contract for two Type 209/1400-Mod Submarines in November 2011 and, in 2015, placed a firm order for two additional submarines included as options in the first contract. The first submarine S41 (861) was delivered in December 2016, and the second submarine S42 (862) was delivered in August 2017. The construction of the third submarine S43 (863) was completed, and it was launched on May 3, 2019. According to the open sources, Type 209/1400-Mod Submarines are fitted with a Combat Management System (CMS) based on ISUS-90 and carry a weapon load consisting of UGM-84L Block 2 Sub-Harpoon missiles (Encapsulated

Harpoon) and DM2A4 Mod 4 Heavyweight Torpedoes (SUT Mod 264 in some sources). Egypt ordered 20 Harpoon Block 2 Guided Missiles through the Foreign Military Sales (FMS) channel in May 2016 for use in submarines.

Currently operating in two different seas, the Mediterranean and Aqaba Gulf (Red Sea), the Israeli Navy has naval bases in Haifa and Ashdod for the Mediterranean and Eilat for the Red Sea and has reshaped its organizational structure in recent years for the safety of natural gas wells and reserves in the Eastern Mediterranean off the coast of Israel. The Headquarters of the Shayetet 7, the Israeli Navy Submarine Flotilla is located in Haifa, and it consists entirely of volunteers. Established in 1959, Shayetet 7 (7th Flotilla) is the leading striking force of the Israeli Navy today. Under the agreement signed in June 1991, Shayetet 7 received Dolphin-I Class Submarines INS Dolphin on July 27, 1999, INS Leviathan on June 29, 1999, and INS Tekuma on October 22, 2000. Diesel/electric propelled Dolphin-I Class Submarines have a length of 57.3m, a height of 12.7m, a beam of 6.8m, and a draught



Super Dolphin CIC



Dolphin I



Israeli Navy Super Dolphin Submarines

of 6.2m with a surface displacement of 1,640 tons and a submerged displacement of 1,900 tons. Dolphin-I (Type 800) Class Submarines features a multi-compartment teardrop hull form and “X” shaped control surfaces (rudder) instead of “+” shape. The submarines have a total of 10 torpedo tubes (six 533mm and four 650mm) and are equipped with ISUS-90/1 Combat Management System (CMS). Dolphin Class Submarines can be armed with 16 heavyweight torpedoes, including their spares (6 spares and 10 in tubes) and different types of Guided Missiles that can be fired against surface targets and can carry 10 Special Forces (Shayetet 13/Flotilla 13) personnel in addition to 35 sailors. Dolphin-I Class Submarines designed exclusively according to the Israeli Navy requirements and used only by Shayetet 7. The unit cost of each submarine is US\$340 million, and the total project cost is US\$1.28 billion. Under the US\$100 million modernization project launched in early 2010, Dolphin-I Class Submarines were undergone a comprehensive maintenance, repair and

refurbishment work. As part of the modernization work carried out at the military shipyard in Haifa under the Main Contractor TKMS/HDW, all the valves, pipes, radar/periscope systems and the main diesel engine of the Dolphin-I Class Submarines were removed and refurbished, Rafael product Torbuster Torpedo Countermeasure System Launchers (10-cell) and decoys were installed, and the submarines were equipped with Rafael product SeaCom IP-based secure audio/data/video and SatCom communication system. Following the US\$26.4 million modernization activities, INS Dolphin Submarine was relaunched in December 2011. Type 800/Dolphin-I Submarines constitute the 1st Submarine flotilla of the Shayetet 7. According to open sources, one of the submarines operates in the Red Sea and the Persian Gulf, and the other in the Mediterranean while the third submarine is located in Haifa (or Ashdod) to protect Israel's coast. Currently, Port of Haifa is the only submarine base of Shayetet 7.

The US\$1.27 billion contract for the construction of the first

two Dolphin-II (also known as Dolphin AIP or Super Dolphin) Class submarines was signed in 2005 between Germany and Israel. The official contract for the construction of the third Dolphin-II Class submarine, which was included as an option in the main contract was signed between Israel and Germany in March 2012 with the participation of the Israeli Minister of Defence Ehud BARAK. The submarines are built at Howaldtswerke-Deutsche Werft (HDW) Shipyard, which is part of the ThyssenKrupp Marine Systems (TKMS). Within the scope of the contract, INS Tannin was delivered in September 2014, INS Rahav was delivered in January 2017, while INS Dragon Submarine, which is still under construction, is planned to be launched in 2020. Dolphin-II Class Submarines, which are equipped with a hybrid propulsion system due to the integration of the Air Independent Propulsion (AIP) System, are 11.3m longer than the three Dolphin-I Class submarines and have a length of 68.6m, a beam of 6.8m and a draught of 6.2m with a surface displacement of 2,083 tons and a submerged displacement of 2,438

tons. Equipped with ISUS-90/55 CMS, each Dolphin-II Submarine can complement a crew of 50 (35 sailors + 15 Shayetet 13 Naval Special Force personnel) and can be armed with up to 21 heavyweight torpedoes (DM2A4) and Guided Missiles. Both Dolphin-I and Dolphin-II Submarines feature three MTU product diesel engines, Kollmorgen product Model 76 attack periscope and Model 90 Optronic Periscope System specially designed according to Shayetet 7 requirements for surveillance. The Elbit product ESM System antenna is also placed on the M90 periscope. It is stated that up to one-third (€135 million/US\$168 million) of the total construction cost of the submarines (around €500 million/US\$650 million each) was subsidized by the German Government. An additional 3 Dolphin-III Submarines will be procured for Shayetet 7, which plans to keep Dolphin-II submarines operational until the 2050s. In this context, a Memorandum of Understanding (MOU) worth US\$1.3 billion was signed between Germany and Israel in June 2017. The official contract for the

procurement of Dolphin-III class submarines is expected to be signed in 2020, and the first submarine is planned to enter Shayetet 7 service in 2030 following the TO 8-year construction period (T_0 =Contract start). Dolphin-III Submarines, which will be equipped with a hybrid propulsion system, are planned to replace the diesel/electric propelled veteran Dolphin-I submarines.

The exterior design of the Dolphin-II Class Submarines with a 7-blade composite propeller resembles the Type 212 Class, while the placement of the AIP System is similar to the Type 214 Class rather than the Type 212. Unlike Type 212, which has two Liquid Oxygen (LOX) tanks outside the pressure hull behind the sail, the LOX tank/tanks (I believe there is only one tank) in Dolphin-II Class Submarines are located inside the pressure hull. On the other hand, the Metal Hydride Tanks (MHT) are placed in a special compartment located at the bottom of the submarine body, three rows on the right side and three rows on the left side (considering the length of the pressure hull I believe

that each row consists of 7 cylinders). The Metal Hydride cylinders are used to store the liquid hydrogen that provides the necessary energy for the Proton Exchange Membrane (PEM, also called as Polymer Electrolyte Membrane) Fuel Cell modules used in the AIP System. In Type 212 Class, Metal Hydride Tanks are placed circularly on both sides of the hull, just below the LOX tanks at the rear. Unlike the Type 214 Class, which has two Siemens product BZM120 PEM Fuel Cell modules (each generates 120 kW power), Dolphin-II Submarines, as in Type 212A Submarines, have 9 (one backup, eight active) BZM34 PEM Fuel Cell modules that generate a total of 306 kW (400 hp) power.

With the introduction of Dolphin IIs, it is considered that the Second Submarine Flotilla was established within Shayetet 7, which will focus on the Red Sea, the Persian Gulf, and the Indian Ocean. Previously,

there were some speculations that Dolphin-II class submarines could be deployed in Eilat. Supporting this speculation, within the scope of the Polynom Project, Israel is currently building high-tech fortified hangars/shelters at Haifa, Ashdod and Eilat ports to protect the Israeli Navy surface and underwater platforms. In this context, new structures such as new warehouse facilities, maintenance/repair shipyards, ammunition shelters, and support facilities are being built at each port at costs exceeding US\$100 million to support surface and underwater platforms. In June 2013, the Elbit Company announced that it had signed a contract under the Polynom Project to build a new submarine dock in Haifa Port for the Dolphin-II Submarines. The giant Fortification (Submarine Hangar) built at Haifa Port was clearly seen in the background in a photograph taken in December 2019.

It is claimed that Dolphin-I and Dolphin-II Submarines can fire submarine-launched cruise missiles (SLCM) from its 650mm (25.5-inch) torpedo tubes. According to open sources, the submarines can also be armed with 1,500km range Popeye Turbo Submarine-Launched Cruise Missiles that can be equipped with a nuclear warhead, providing Israel with a second-strike capability in case of a nuclear attack. Regarding the issue, on July 4, 2012, Kocaeli Deputy Lütfü TÜRKKAN asked a written question to the Prime Minister of the time, Recep Tayyip ERDOĞAN. In response, on November 5, 2012, the Minister of Foreign Affairs of the time, Ahmet DAVUTOĞLU stated that the three Dolphin-I Class submarines in Israel's inventory can only launch Popeye and Delilah Missile Systems that cannot be equipped with nuclear warheads and emphasized that "despite the media reports on Israel has modernized the submarines brought from Germany to launch nuclear-armed cruise missiles, there is no information confirming that this modernization was realized."



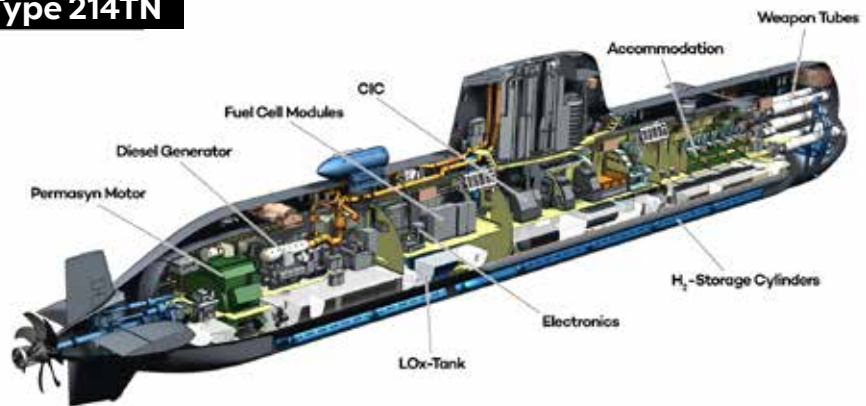
Super Dolphin Class INS Tanin seen here during sea trials executed within the scope of SAT Phase

Conclusion

As of January 2020, in terms of submarine power in the Eastern Mediterranean, Shayetet 7 (Flotilla 7) with 5 active Dolphin-I and Dolphin-II Submarines (3 diesel/electric, 2 hybrid-propelled) has fewer platforms when compared to the Turkish Naval Forces Submarine Group Command with 4 AY Class, 4 PREVEZE Class, and 4 GÜR Class diesel/electric propelled submarines. However, the hybrid (diesel/electric + AIP) propelled Dolphin-II Submarines have superior capabilities than the submarines operated by the Turkish Naval Forces Submarine Group Command in terms of their technical features. With the introduction of Hybrid propelled REİS Class Type 214TN Submarines from 2022 and PREVEZE Class Submarines, which would be modernized with national capabilities, from 2023, Turkish Naval Forces Submarine Group Command will also achieve technical superiority in terms of submarine strength in addition to its current numerical advantage. However, with the Dolphin-III Submarines (I believe that they will be equipped with AIP + Reformer + Lithium-Ion Battery) planned to be introduced from 2030, the technical/technological superiority will change again in favor of Israel. In this respect, it is highly crucial to complete the National Submarine Project (MİLDEN) in the 2030s.

The ability to launch

Type 214TN



nuclear-armed cruise missiles is the most significant superiority of the Israeli Navy Submarine Flotilla Command Shayetet 7 (7th Flotilla) over the Turkish naval Forces Submarine Group Command. However, Israel will only be able to use this weapon in retaliation for a hostile nuclear attack. Moreover, it is evident that the force structure of the Israeli Navy would not be enough if Israel engages in a long-term naval conflict without resorting to nuclear weapons because the current force structure of the Israeli Navy is not capable of supporting this country's maritime interests in the Eastern Mediterranean in a long-term naval war.

In the last ten years, various procurement projects that will shape the future of the Turkish Naval Forces Submarine Command (TNFC) and meet its critical needs have been accomplished with high domestic contribution rates under the successful coordination of the Presidency of Defence Industries (SSB). The Submarines of the Turkish Naval Forces Submarine Group Command are equipped with numerous high-tech products including Aselsan ARES-2SC (AY Class) and ARES-2NS (REİS Class) ECM systems, ASIST Submarine Intercept Sonar System, Meteksan Defence Intercept Passive Sonar (IPS) and

MHS-01 Hydrophones, ArmerKom MİLPAS (National Passive Sonar, AY Class), ArmerKom/TÜBİTAK MÜREN CMS (Combat Management System, AY Class), TÜBİTAK MAM Submarine Active Sonar System (AY Class), ZARGANA Torpedo Counter Measure System Launcher and ZOKA Decoy Family as well as Radar Absorbing Materials (RAM). Within the scope of ongoing projects, integration activities of 6-cell ZARGANA TCMS Launchers (four units per submarine) into PREVEZE and GÜR Class Submarines are continuing (the work on the PREVEZE Class TCG Anafartalar was completed in the first quarter of 2019 and the



submarine was spotted on April 2, 2019, with the launchers installed). Additionally, under the MÜREN-PREVEZE Project, the PREVEZE Class submarines are equipped with ADVENT-based MÜREN CMS, and under the PREVEZE Mid-Life Upgrade (MLU) Project, Aselsan provides all wet-ends of the sonar systems to be used in the submarines. Furthermore, Aselsan products SatCom, Integrated Combat System, ARES-2SC Radar ESM System, and ALPER Low Probability of Intercept (LPI) Naval Radar Systems are also integrated into submarines. PREVEZE Class Submarines are expected to be equipped with AKYA National Heavyweight Torpedoes. During the Annual Evaluation Meeting for 2019 held at Bestepe National Congress and Culture Center in Ankara on January 16, 2019, President Recep Tayyip Erdoğan informed that

the first launch test of the AKYA prototype was successfully carried out. According to the information we received, the last launch test with the AKYA prototype was successfully performed in December 2019, and the first torpedo launch integrated with MÜREN-CMS is expected to be completed at the end of 2020 or early 2021. On the other hand, ATMACA Block-II guided missile (submarine-launched Encapsulated ATMACA version) with both active RF and IIR seekers is expected to be used in both PREVEZE and REİS Class Submarines (CMS software modification is required). The development activities of the GEZGİN National Cruise Missile are ongoing, and it is considered to be used for the first time on MILDEN platforms. However, when the missile is ready, I expect it to be used in PREVEZE Class Submarines equipped with MÜREN CMS from the mid-2020s.

The infrastructure established for REİS Class Submarines will be used in the design and construction of the first national submarine, MILDEN, which will be designed and built with a high domestic contribution rate and national resources. Although initially thought to have similar dimensions and displacement as the REİS Class, I believe that MILDEN boats will be slightly longer and heavier than planned. I think MILDEN Submarines will have a length of around 75-80m, a beam of 7m, a draught of 6.5m, and a submerged displacement between 2,500-3,000 tons and unlike the REİS Class, MILDEN Submarines will have at least one Reformer. Preferred for long-range missions, Reformer is preferred for large (over 2,000 tons) submarines. Both PEM Fuel Cell modules and Reformers to be used in MILDEN submarines to be equipped with 300kW (400hp) AIP System will be designed and produced nationally, and the systems will also be developed

domestically under the Submarine Propulsion System Components Development Project. The PEM Fuel Cell modules, which will be manufactured locally by the company to be selected under the project, are intended to replace the BZM120 modules currently used in REİS Class Submarines in the following years. Additionally, unlike the REİS Class, MILDEN Class is expected to use locally produced Lithium-Ion (Li-Ion) batteries (LIB) with higher power and capacity instead of lead-acid batteries. Unlike REİS Class submarines, which are currently under construction, and AY, PREVEZE, and GÜR Class submarines, which have a single compartment cigar-shaped hull form, MILDEN class submarines will have a multi-compartment teardrop hull form. I think that MILDEN will have at least six 533mm heavyweight torpedo tubes and one 650mm deployment station to allow SAS/SAT underwater operations.



Turkish PREVEZE Class Submarine took part in NATO's Dynamic Manta 2018 Exercise

Dolphin-I



Length:	57.3m
Beam:	6.8m
Height:	12.7m
Draught:	6.2m
Displacement:	1.640 tons surfaced, 1.900 tons submerged
Surface Speed:	11 knots
Submerged Speed:	20 knots
Complement:	30 + 10

Dolphin-II



Length:	68.6m
Beam:	6.8m
Height:	12.7m (?)
Draught:	6.2m
Displacement:	2.083 tons surfaced, 2.438 tons submerged
Surface Speed:	11 knots
Submerged Speed:	25 knots
Complement:	35 + 15

Type 214HN



Length:	65.3m
Beam:	6.3m
Height:	13.1m
Draught:	6.0m
Displacement:	1.688 tons surfaced, 1.858 tons submerged
Surface Speed:	10.5 knots
Submerged Speed:	21 knots
Complement:	27

Type 214TN



Length:	68.35m
Beam:	6.3m
Height:	13.1m (16.5m with periscopes)
Draught:	6.0m
Displacement:	1.865 tons surfaced, ~2.050 tons submerged
Surface Speed:	12 knot
Submerged Speed:	22 knot
Complement:	27 +13

Type 209 / 1200 (AY Class)

Length:	61.2m
Beam:	6.2m
Height:	12m
Draught:	5.5m
Displacement:	980 tons surfaced, 1.185 tons submerged
Surface Speed:	11 knots
Submerged Speed:	21.5 knots
Complement:	38

Type 209 / 1400 Mod (PREVEZE and GÜR Class)

Length:	62m
Beam:	6.25m
Height:	12.5m
Draught:	5.5m
Displacement:	1.454 tons surfaced, 1.586 tons submerged
Surface Speed:	15 knots
Submerged Speed:	21.5 knots
Complement:	30