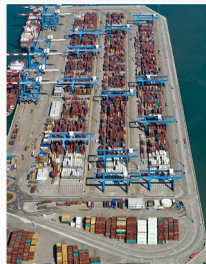
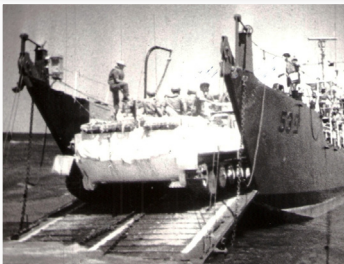


MARITIME STRATEGIC EVALUATION FOR ISRAEL 2019/20

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The SAAR¹ Missile Boats: The Israel Navy's Surface Warships

*Eli Rahav*²

Introduction

This year marked the 50th anniversary of the extrication of the five Cherbourg ships. The extrication of the ships from France was the final stage of the Israeli Navy's acquisition of 12 SAAR missile boats. The transition from a navy built on 3 destroyers³ and few old torpedo boats to a navy of small and fast boats armed with Gabriel sea-to-sea missiles represented a major change in the Navy's strategic thinking. That change proved itself in sea battles during the Yom Kippur War in 1973.

The marking of the 50th anniversary of the arrival of the Cherbourg boats in Israel is an opportunity to take a historical perspective on the current buildup of the Navy, namely the acquisition of four MAGEN (protector) ships which are currently being built in Germany and are based on the Braunschweig-class corvette. The MAGEN ships represent the largest investment ever made in surface warfare by the Israeli Navy.

This article will carry out a comparison of the considerations and decisions that led to the abandonment of small and fast SAAR missile boats and the adoption of the new MAGEN ships. This choice to use a few slow, large and expensive vessels stands in contrast to the strategy of the Navy since the 1960s, which was based on a larger number of small and fast vessels with versatile capabilities. (The article will not discuss the submarine fleet).

The article begins with a historical survey of the change in the Navy's strategy, which led to the acquisition of the SAAR missile boats during the 1960s and 1970s, and a description of the absorption and successful operation of the missile boats in the Yom Kippur War. The article will then describe the acquisition of the MAGEN corvettes, the threats they are meant to deal with and a comparison of the MAGEN corvettes to the SAAR missile boats.

Choosing the large and slow German corvette as the Navy's new ship (known as the MAGEN or SAAR 6 class) represents a missed opportunity to upgrade Israel's naval power, to reduce the size of its navy and to support local industry, namely Israel Shipyards – the natural choice for producing ships for the Navy.

1 SAAR (Hebrew): Attack, assault, storming

2 Rear Admiral (ret.) Eli Rahav served in the Israeli Navy from 1958 to 1985. His last position was Head of the Sea Department in the IN staff.

3 During that period, there were three destroyers in the Navy: INS Eilat, INS Yaffo and INS Haifa.

Historical background

The decision to equip the Navy with missile boats: New Destroyers versus SAAR Attack Craft

Admiral Yohai Ben-Nun became commander of the Navy in 1960. Based on personal experience, he was aware of the inferior capabilities of the Navy during that period. During the War of Independence (1948), he had sunk the enemy ship El-Amir Farouk and understood how precarious for a light explosive boat to get into attack position against a speeding target. As commander of the destroyer INS Yaffo during the Sinai Campaign in 1956, during which the Egyptian destroyer Ibrahim El-Awal was captured, he had observed the ineffective battle of cannons, in which Israeli destroyers had fired hundreds of shells and had scored very few hits on the target. It was clear to him that the destroyers serving in the Israeli Navy were an inferior platform and that the Israeli Navy is in need of a different type of vessel.

In 1960, once he became commander of the Navy, Ben-Nun instated several weekly meetings of the senior naval staff in order to brainstorm.⁴ The team concluded that it is necessary to create a new type of naval power that will facilitate offensive maritime initiatives, rather than making do with mere coastal defense. However, the naval force would need to be such that the State of Israel could afford its construction and operation.



Figure 1: The *Skori* destroyer

The main threat to Israel's security in the maritime domain was the Soviet-produced *Skori* destroyers, operated by Egypt. The Israeli Navy's three British-made destroyers were inferior to the *Skori* destroyers, and the Navy was looking for a response to that threat. The torpedo boats, the Navy's other type of vessel, were effective as fast gunships against small targets. The use of a torpedo, however, requires getting

4 Yitzhak Shushan, *The Eilat Destroyer*, p. 145.

relatively close to the enemy, which made the torpedo boats vulnerable and inferior when dealing with the *Skori* destroyers.

The plan to upgrade the Navy initiated by Admiral Ben Nun was unique in that it departed from the conventions of maritime warfare by achieving technical advantage of a single warship. By making do with smaller ships and given the acquisition budget of the Navy, it was possible to acquire a large number of warships.

In March 1960, Prime Minister David Ben Gurion met with Konrad Adenauer of West Germany in New York. Ben-Nun leveraged his ties with then aide to the prime minister Shimon Peres to introduce a paragraph into the new aid agreement between Israel and Germany —after the reparations agreement had expired—which specified the delivery of six new torpedo boats to Israel.⁵ When Ben-Nun formulated the request for these new ships, it is doubtful that he already knew with what lethal weapons they would be armed. There were suggestions at that time for an advanced homing torpedo named Karish, which were never implemented. At that time, planning began in secret for the development of the Gabriel sea-to-sea missile, which was based on the Luz missile that had been developed for the Artillery Corps by Rafael and later together with Israel Aircraft Industries. The planned range of the Gabriel missile was 20 kilometers, somewhat longer than the maximal range of the *Skori*'s guns (note that this was prior to the Czech deal in which the Egyptians and Syrians acquired the Soviet Styx missiles that had a range of about 80 kilometers.)

In January 1963, Commander Ben-Nun presented the outline of the Navy's acquisition to the General Headquarters, commanded by the Chief of the General Staff Zvi Tsur. It was based on the SAAR missile boat and Ben-Nun's presentation of the project included the following:

“The Navy has fully exploited the potential of its existing vessels for solving the problems in the maritime arena...What is needed is a Navy that can achieve its primary mission using the fastest and cheapest way of destroying the enemy's navy during the initial days of fighting and will have the capacity to fulfill most of the tasks required of it by the General Staff in an all-out war, in a limited engagement and in routine security tasks. The solutions lie in a change in thinking and in the development of superior weaponry that will allow carrying out the new strategy. The weaponry required consists of missile boats and submarines that will replace the destroyers and torpedo boats.”⁶

5 Abraham Rabinowitch, *The Cherbourg Boats*, p. 45.

6 Shia Ben Nun and Dita Grey (eds.), “*The time Took Us*”, Ministry of Defense, pp. 116-118. [Hebrew] “The statement by Admiral Yohai Ben-Nun during the General Staff discussion, January 1963, in which it was decided to approve the Saar boats project.”

In the discussion at the General Staff Headquarters, Chief of the General Staff Zvi Tsur approved the Navy's proposed missile boat project. It was decided that the Navy's main force would be based on a single class of fast, small and relatively inexpensive boats that would provide the Navy with the following advantages:

- **The vessel** would have the ability to engage with both destroyers and missile boats, and thanks to its high speed it would also dictate the terms of the battle. The vessel would be operationally independent as a single ship or as part of a task force.
- **Armaments** – The vessel would be armed with guided missiles and automatic dual-purpose radar-guided cannons. The ratio of cannons to missiles would vary according to the nature of the mission and various combinations of weaponry would be available in assembling task forces.
- **Speed** – The vessel would be faster than any existing ship in the arena or any ship that might be deployed in the reasonable future. The maximum speed would be at least 40 knots.
- **Mobility and range** – The vessel's operating range would be about 1000 nautical miles at a speed of 30 knots, which would allow it to be transferred quickly from one area to another and would allow the concentration of force at a decisive point. Such operating range was sufficient for missions in the Eastern Mediterranean arena. Essentially, its operating range span across the eastern quarter of the Mediterranean, which includes the coast of Syria, most of the Egyptian coast and the waters up to Crete, Greece.
- **Resilience** – The vessel would be able to maneuver in rough seas and to operate its weapon systems in seas up to a strength of 5 Beaufort scale
- **The acquisition process** – The buildup would be gradual and continuous, in line with budget constraints. Following the introduction of the first 6 vessels that would be built abroad, the Navy will consider transitioning to construction to Israel.⁷

"The Navy sets out for the open seas" – In 1963, while I was a commander of a torpedo boat in Eilat, we had the privilege of a visit by Admiral Yohai Ben-Nun, the commander of the Navy, during an assembly of officers at the Eilat Navy base. He stated that "the Navy is setting out for the open seas with a large number of fast boats carrying deadly weaponry." In view of the disbelief his words were greeted with, he added "several dozen of them" (Eli Rahav).

Implementation of the plan to acquire a missile boat force

As mentioned, in the early 1960s the Navy did not have the capacity necessary to carry out its missions in the maritime domain. Thus, it needed to upgrade its force as quickly

⁷ Shlomo Erell, "*Facing the Sea*", The Story of a Fighting Sailor and Commander. p. 215.

as possible. In order to keep costs low and to shorten the timetable for introducing the new vessels, it was decided not to develop a new type of ship and build a prototype for quality testing, as was customary in other navies. Rather, an existing boat with proven operational track record at sea would be chosen, and the new vessel would be built based on such principle design at minimal cost.

It was decided to build upon the successful Jaguar torpedo boat of the German Navy, which best met the required specifications. The engineers at Lürssen, a German shipbuilding company, modified the planning of the body of the original torpedo boat in order to switch from wood to steel and lengthened it by about 3 meters. The construction within Lürssen shipyard had stopped by order of the German government due to pressure by the Arab countries. An alternative was found at the Cherbourg shipyard in France where 12 ships were built, in two batches of six each. The French embargo on the sale of weapons to Israel following the Six Day War led to a freeze in the delivery of the last five boats, which were extricated out of Cherbourg on Christmas Eve 1969. The ships built in Cherbourg were named the SAAR missile boats and were divided into SAAR-1 class, SAAR-2 class and SAAR-3 class (see below).

In parallel to the construction of the boats at Cherbourg and following the capture of Sinai and the opening of the Straits of Tiran in the Six Day War, Defense Minister Moshe Dayan ordered an assessment of the importance of the Red Sea, which directed that the SAAR missile boats be deployed there in order to ensure passage through it. Shlomo Erell, the commander of the Navy at the time, explained that the nature of the Red Sea, the distances to potential points of conflict and fact that its shores are controlled by enemy states requires the use of larger ships.⁸ As a result, six larger SAAR 4 class ships were ordered, this time from Israel Shipyards and based on Lürssen's design. Thus, the wish for domestic construction of boats was fulfilled.⁹

These SAAR 4 boats were built with the capability of carrying eight Gavriel missiles and two 76mm cannons, based on lessons learned from past experience. The propulsion system was identical to the previous models. The cruising speed remained 30 knots, but the maximum speed was only 35 knots as opposed to 40 knots of the initial SAARs.

Moshe Dayan's vision for the Red Sea, which was contested by the Chief of the General Staff Haim Bar-Lev, was essential to clearing the path for technological progress and growth in Israel's naval forces.

8 Shlomo Erell, *ibid.*, p. 283.

9 Shlomo Erell, *ibid.*, p. 287.



Figure 2: Gabriel missile launch from SAAR 4 ship

Development of the SAAR boats' battle Doctrine

The war fighting capability of the missile boats required a fundamental change in the Navy's strategy. Hadar Kimchi, the commander of the missile boat fleet, initiated and formalized a comprehensive new tactical doctrine, based on cooperation between units, stealth, deception and high speed assault. Commencing with missile fire and completion with cannon fire. Training the weapons systems could be done using simulation (an innovation at the time), such that repeated training exercises were possible without actually firing a 'live' missile. A tactical training simulator was built at the Navy's training base in Haifa and the boats' crews trained for combat, both near the coast and out at sea.

By the time the SAAR boats went into service, the Arab navies had acquired ships armed with the Styx missile. The Egyptian navy had actually used the missile to sink the Israeli destroyer INS Eilat in 1967 and the fishing boat Orit in 1970. The range of the Styx missile was double that of the Gabriel, which put into question the ability of the SAAR boats to defeat the enemy's navies.

Despite the difference in ranges, Adm. Avraham Botser, then commander of the Navy, decided to acquire the shorter-ranged Gabriel missiles rather than wait for the development of a longer-range missile. The Navy's electronic engineers developed innovative solutions for the deception of incoming missiles. They developed chaff

rockets that would mislead the radar of enemy ships. The SAAR boats' battle doctrine and training exercises were carried out in order to achieve close cooperation with the Israeli Air Force for air attacks while the boats were closing the missile range gap with full speed.

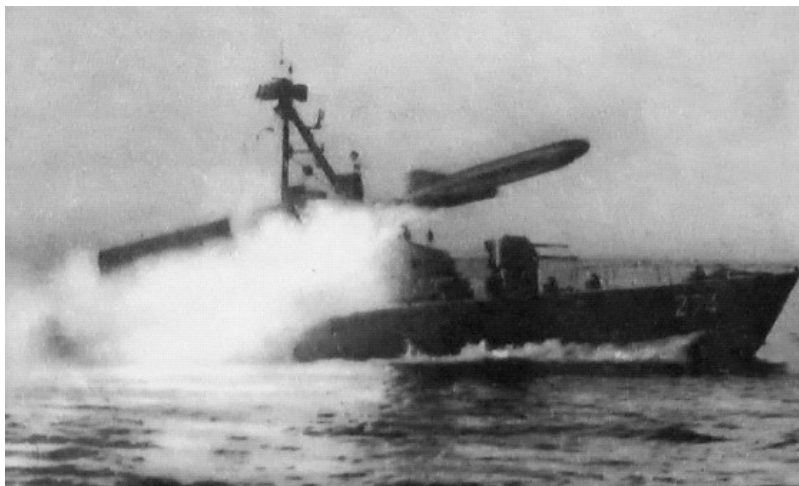


Figure 3: Komar class ship launching a styx missile

The intention to introduce the fast attack craft in short time, precluded the possibility of testing a prototype. The boats were produced simultaneously with their weapon development, and quality control was less than optimal. This was reflected in technical malfunctions, at times even during battle. It is worth mentioning that the problems with the propellers and the motors were fixed, and the malfunctions of the first batch of 76 mm guns were almost completely corrected in the second batch of the guns production that was installed on the SAAR 4 missile boats, in addition to the improvement in the reliability of the Gabriel missiles.

The successful introduction of the missile boats can be summarized in the fact that each SAAR boat commander knew: that he is receiving a fighting unit which is superior in performance and speed over any enemy unit it would be sent to confront. That it has destructive capability along with the ability to countermeasure and win in combat. That, despite the gap in the missile ranges which mandated alertness and skill in counter-missile tactics and the cooperation of the entire crew.

The boats had a relatively a small hull in order to reduce costs and thus increase the number of units that may be acquired. The size of the crew was relatively small, such that potential casualties would be less than those experienced in the sinking of the INS

Eilat. Over only a few years, the Israeli Navy reached a high level of readiness. The number of fighting units resulted in local superiority in offensive initiative.

The Yom Kippur War

The Israeli Navy force in October 1973, prior the break of the Yom Kippur War, consisted of 13 fighting units: 2 SAAR-4 missile boats (produced by Israel Shipyards); 6 SAAR-3 missile boats; 4 SAAR-2 missile boats and 2 SAAR-1 boats, which had not yet been armed with missiles (such 12 boats produced in Cherbourg). The Egyptians and the Syrians navies had a quantitative advantage in ships and their missiles had a longer range. The Israeli Navy had an advantage in electronic defense systems for deception and decoys. The events of the war proved that the strategy chosen in the buildup of the Navy's force had not been mistaken. The SAAR missile boats passed the test.

The number of warships was slightly more than the critical mass required. The offensive initiative adopted achieved local superiority in most of the battles.

Letal weaponry – The Gabriel missile proved itself in battle. About 50% of the missiles fired hit their targets. A hit by even one missile was enough to disable an enemy ship.

Missile defense – The investment in missile countermeasures proved its worth. Most of the enemy missiles were fired at decoys and even those aimed at the SAAR boats missed the target.

The success of the military tactics – “tough in training, easy in combat” – Although a coordinated attack according to the SAAR's battle doctrine occurred only once,¹⁰ the familiarity with the doctrine created a common language and every boat commander knew what was expected of him at any given time.

Air Force Cooperation – During the war, the Israeli Air Force was preoccupied with other missions and on other fronts. Air support was provided only in the Port Said battle on the night between October 6th and 7th, 1973. The Air Force's actual involvement was not during the stage of closing the gap in range between the Gabriel and Styx missiles as initially expected, but rather in the chase after a fleeing Egyptian boat. The Egyptians commanders were attacked from the air, and did not manage to obtain a clear picture of the situation and not fire Styx missiles while being chased at sea. Lieutenant Colonel Eliezer Prigat, flying a Phantom F-4, destroyed an Egyptian Osa missile boat with his last bomb.

10 On the 8th of October, 10 Saar boats carried out a frontal assault while deploying decoys in the Port Said area. However, the identification of targets on radar had been mistaken and the attack was called off.

The high speed of the SAAR boats was needed in order to chase fleeing enemy ships after they had fired all their missiles rather than to close the gap in missile ranges, as was deemed needed. The Syrian and Egyptian missile boats remained close to their bases and managed to return there before the Israeli missile boats came within missile range.

High continuous speed – All of the SAAR missile boats could maintain a cruising speed of 30 knots, which enabled concerted forces and quickly prioritizing forces between the Syrian front and the Egyptian front as needed.

The **76-mm automatic cannons** suffered a number of recurring malfunctions, preventing victory in some of the battles.

Shipbuilding in Israel – Six of the SAAR 4 missile boats had been ordered from Israel Shipyards, of which two had been delivered prior to the war. These ships proved themselves beyond any expectation. As mentioned above, the SAAR 4 missile boats were built in order to serve in the Red Sea. According to the plan, they were meant to set out for the voyage around Africa on October 15th. Since the war broke out on the 6th, they operated in the Mediterranean during the war and played a crucial part in the Navy's success.¹¹ The SAAR 4 boats operated during the latter part of the war in order to guard essential marine shipping to Israel in the eastern part of the Mediterranean and as part of this mission, they reached as far as Malta (where the Egyptians had deployed a destroyer) and operated under difficult sea conditions.

In view of the success of the missile boats in the war, Minister of Defense Moshe Dayan decided to build another batch of six SAAR 4 boats at Israel Shipyards (Project "Nadran"), intended to serve in the Mediterranean. This was in addition to the first batch of six ships that was destined for the Red Sea.

Export – Following their success in the war, the South African navy decided to acquire the SAAR 4. In following years, used SAAR 4's that were no longer in service were sold to the navies of Chile, Sri Lanka and Mexico.

11 In the Latakia battle on the 6th, the INS Reshef was the first to score a hit with their 76 mm cannons on a Syrian torpedo boat that was detected at sea by Latakia. She was also the first to score a hit with a Gabriel missile against a Syrian minelayer that was detected in that same battle. In the battle of Damiyat, on the 8th, the INS Keshet was the first to score a hit with a Gabriel missile against an Egyptian fleeing Osa-class missile boat. The INS Reshef joined the force with only 4 Gabriel missiles and was the last to break off contact in the chase after the Egyptian Osa near Alexandria. The effectiveness of the Saar 4 missile boats was proven when on that same mission which they shelled coastal targets in western Egypt and from there were sent to guard shipping in the area of Crete. They were at sea for a full week.



Figure 4: SAAR 4- INS Keshet

The SAAR 4.5 missile boat (project "Nirit")

In 1978 Admiral Michael Barkai, the commander of the Israeli Navy, wanted to add an aerial platform to the offensive capabilities of the SAAR missile boats and therefore designated two of the boats to serve as helicopter-carrying command ships. The positioning of a landing platform and hangar on the rear deck required a change in design. The last two ships in the "Nadran" project were lengthened by almost four meters and were given the name "Chohit" (Finch).¹² The lengthening of the hull gave the ship better flow lines and all of the subsequent boats were built according to this design, with no facilities for helicopters. These boats were named SAAR 4.5.

VADM Micha Ram, the commander of the ISN Reshef during the Yom Kippur War, took over command of the Navy in 1989 and decided on the gradual replacement of the aging SAAR 2 and SAAR 3 ships with the SAAR 4.5.

With the explanation: "On the third overhaul, the body will be replaced". Each new boat that was launched was assigned the same crew and name of the boat that was being retired from the force. As a result, the newly built boats gathered no resentment. The SAAR 4.5 boats were armed with the most advanced systems and in time took on most of the Navy's missions. The gradual renewal of the Navy's force structure made it possible to maintain high level of readiness.

¹² Two Chohits operated as part of the missile boat flotilla from 1981 until their sale to the Mexican Navy in 2004.



Figure 5: SAAR 4.5- INS Kidon

The SAAR 5-class corvettes

Three SAAR 5 helicopter capable corvettes went into service in the Israeli Navy during 1994-1995, about 25 years ago.¹³ The acquisition of the SAAR 5 missile boats began at the initiative of Israel Shipyards, which in the mid-1970s and during the construction of the SAAR 4 missile boats had proposed the construction of a warship twice the size of the SAAR 4. The proposal was not accepted by the IN command at the time. In 1985, the Navy, under the command of Avraham Ben Shushan, carried out special operations on Palestinian targets in Algeria and Tunisia. Fighters from the commando units (Shayetet 13) and Sayeret Matcal (The General Staff Reconnaissance Unit) were delivered ashore in small boats that were placed on the SAAR 4 decks. The operations were carried out in heavy seas and the retrieving of the boats stretched the capabilities of the SAAR boats to their limit.

Operating at long distances required refueling from a taker ship. These operations convinced the IN command to acquire a number of larger ships.

General Israel Tal was asked examined the structure of naval forces in 1988 and recommended the acquisition of three larger vessels. Three corvette helicopter carriers¹⁴ were ordered from the United States. They were named "SAAR 5", even though they were not having the principles of the former SAAR types. The corvettes were equipped with a towed submerged detection system that was supposed to give

13 The older of them, the INS Eilat, went into service in May 1994; the INS Hanit went into service in February 1995.

14 A corvette type is a fast ship with high maneuverability, with a displacement of between 500 and 2800 tons.

them long range detection capability. An examination of the capabilities of the SAAR 5 corvettes relative to their missions paints a complex picture.

The **destructive capability** of the SAAR 5 corvette was limited relative to the SAAR 4.5 as it was not equipped with a surface cannon. This precluded the ships from operating offensively at short ranges against other ships, such as terrorist boats, or against coastal targets. During the 25-year period they were in service, the corvettes were not involved in any firefights. The **emphasis on missile countermeasures** on these ships was of little benefit, as can be seen from the incident in which the INS Hanit, while enforcing a naval blockade near Beirut during the Second Lebanon War (2006), was hit by a C-802 missile fired from land. Nonetheless, the SAAR 5 corvette proved useful in **transporting of commando forces** as part of the mission to intercept commercial vessels carrying armaments far from Israel's shores. The hangar and crane on the deck of the ships were used to carry and launch the rubber boats and equipment of the Shayetet 13 commando force.

Table 1: The SAAR-class ships serving in the Navy

Class	Quantity	Built by	Weapons	Size in tons	Year of production	Crew	Maximum speed in knots	Cruising speed in knots	Length in Meters
SAAR 1*	3	Constructions Mécaniques de Normandie	3 Cannons	250	1967	40	42	30	45
SAAR 2*	3	Constructions Mécaniques de Normandie	5 Missiles 2 Cannons	250	1968	40	42	30	45
SAAR 3*	6	Constructions Mécaniques de Normandie	6 Missiles 1 Cannon	250	1969	40	42	30	45
SAAR 4*	10	Israel Shipyards	8 Missiles 2 Cannons	415-450	1973-1970	45-50	34	30	58
Chohit*	2	Israel Shipyards	Missiles Helicopter	490	1980	53	34	30	61.7
SAAR 4.5	8	Israel Shipyards	Missiles Canon	490	1991	50	34	30	61.7
SAAR 5 corvette	3	Ingalls, USA	Missiles Helicopters	1,200	1995	74	32	17	85.64
SAAR 6 corvette	4	ThyssenKrupp, Germany	Missiles Cannon Helicopters	2,000	Under construction	75	26	15	89.12

* indicates ships that are no longer in service

The capability of Israel Shipyards

Israel Shipyards has proven its capability in the construction of fast attack crafts. Improvements were made in each batch of ships ordered from it. In the past 20 years or so, the Navy has acquired patrol boats only from Israel Shipyards and no missile boats. Israel Shipyards has been attentive to the Navy's needs and planned an advanced ship for it, as part of the "SAAR 72" project which was presented in May 2013 at a naval exhibition in Singapore.¹⁵ Smaller ships were built for Cyprus¹⁶ and a country in Africa.¹⁷ In November 2019, it was announced that Israel Shipyards had received an order to design a new ship for the Navy.¹⁸

Acquisition of the MAGEN ships

During the 2010s and following the discovery of offshore natural gas in Israel's economic waters, the need arose to guard the natural gas production and transport facilities against enemy activity. The timing was favorable with respect to the Ministry of Finance and financing became available to strengthen and renew the Navy's force structure.

In 2013, it was decided to use the royalties received from the production of natural gas¹⁹ to finance the acquisition of the MAGEN ships (referred to by the Navy as SAAR 6). The main task of the ships was presented as the protection of offshore gas facilities. Their designation as a platform for the firing of missiles at enemy coastal targets remained unpublicized.

During the acquisition process, it was decided on a size of 2000 tons and during the tendering and acquisition process—many details of which have not been made public and some of which are subject to investigation. It was decided that the ships would be constructed by the German ThyssenKrupp company. The deal to acquire the ships

15 "The Navy's new warship is unveiled", Pazam website, May 20, 2013
<https://www.mako.co.il/pzm-magazine/war-games/Article-8a463c2eb6dbe31006.htm> [Hebrew]

16 The Saar 62 for Cyprus, promotional film clip of Israel Shipyards, January 2018
https://www.youtube.com/watch?v=J_zyzu-h-ww.

17 "Israel Shipyards has sold patrol boats to the gas rigs in Cyprus. Price: One-third of that paid by the Navy to the German ThyssenKrupp", the Calcalist site, September 14
<https://www.calcalist.co.il/articles/0.7340.L-3721211.00.html> [Hebrew]

18 Udi Etzion, "Learning the lessons of File 3000? The Navy's new missile boats will be built in Israel", Calcalist site, November 6, 2019. [Hebrew]

19 Yuval Azulai, "Germany will sell the ships for defending the gas fields for about NIS 1.8 billion," Globes site, May 11th, 2015. [Hebrew]

was signed in 2015 and had a value of about 430 million Euro,²⁰ about one-third of which (115 million Euro) was covered by a subsidy from the German government to ThyssenKrupp, with the remainder of about 315 million Euro coming from the State of Israel.²¹ In the end, the ships were built by the German Naval Yards company, which is owned by businessmen from Abu Dhabi and Lebanon. The Ministry of Defense claimed that this shipyard is only building the hull while the ship's systems will be installed in Israel.

The ISN Magen, the first of the four corvettes being built in Germany, was launched already in May 2019²² and will arrive in Israel during 2020 for the installation of the weapons systems. It is expected that the ship will go into service in 2022.²³

The reference threat

In characterizing the Navy's future ship, the reference threat that it will face needs to be defined. The type of combat and the future reference threat will be complex warfare against state navies, such as the Egyptian navy which is the strongest among those of the Arab navies, asymmetric warfare and littoral warfare (Such as the incident during the Second Lebanon War in which the INS Hanit SAAR 5 was fired on), hybrid warfare, a platform for sea control scrutinizing ships at high seas, guarding Israel's shipping lanes at long range, protecting Israel's economic waters, assistance in land battles, etc.

The **Egyptian navy** is currently being upgraded with 58 ships armed with sea-to-air and sea-to-sea missiles. The ships and weaponry are manufactured in the West and are state-of-the-art. Egypt signed a peace treaty with Israel in 1978 but it should be recalled that during the Yom Kippur War, the Egyptian navy was able to block the Red Sea to shipping and today it is capable of blocking shipping and air traffic to Israel in the Mediterranean, in addition to blocking the Red Sea. In view of the IDF's general lack of preparedness to deal with the Egyptian threat,²⁴ it is not at all clear how Israel's Navy would deal with the Egyptian navy in the Mediterranean if and when such need comes.

20 Hagai Amit, "The hidden cost of Case 3000 – half a billion shekels per year", The Marker site, May 20th 2019. [Hebrew]

21 Meirav Arlozorov, "The strange loan from the Ministry of Defense," The Marker, May 20th, 2019. [Hebrew]

22 In view of the submarine scandal, the Saar 6 Hamagen ship was launched in Germany, Sherut Globes, May 24, 2019. <https://www.globes.co.il/news/article.aspx?did=1001287023> [Hebrew]

23 Video clip of the launch of ISN Magen. [Hebrew]
<https://www.facebook.com/israel.navy/videos/377551746220116/?v=377551746220116>

24 Yoav Zitun, "IDF preparedness for war: Netanyahu met with Yitzhak Brik", ynet, December 24, 2018 <https://www.ynet.co.il/articles/0,7340,L-5432313,00.html> [Hebrew]

If the reference threat is not the Egyptian navy, then the question regarding the operational need for a naval force structure remains unanswered.

Fire from ship to Shore – In 2004, a proposal was made to the General Staff for a multi-purpose ship with a displacement of about 15,000 tons that would carry helicopters and amphibious forces. This capability was deemed essential according to the scenarios for fighting in the Mediterranean and for special missions in other theaters.²⁵

The main purpose of the proposal was described by VADM Yedidya Yaari:

“A multi-purpose ship can serve as an alternative fire platform for precision long-range weaponry that will serve as a backup in situations where the Air Force’s capabilities have been compromised. The intention would be to deploy such a backup outside the land territory of Israel, and that it would have the same effectiveness as the air force in striking deep into enemy territory. The weaponry needed for this exists, but the ships that can carry out the mission out at sea must be acquired and that calls for a ship that can carry a large number of missiles. A ship with long-range radar that is located out at sea will itself be able to gather information on the entire theater consisting of the eastern quarter of the Mediterranean.”²⁶

The project proposed by the Navy and supported by the Army Headquarters was not approved in the General Staff.

The inability to accurately hit coastal targets was sorely felt during the Second Lebanon War. Nonetheless, since the Protective Edge operation the Navy has carried out many ship to shore attacks. Notably, such a capability may be attainable using smaller vessels such as the SAAR 4.5.

The shore missile batteries threat – During the Second Lebanon War, the INS Hanit, a SAAR-5 class corvette, was hit by a missile launched from Lebanon shore.²⁷ The Navy at that time did not have a comprehensive solution for destroying enemy coastal batteries. Attention shifted to acquisition by the Hezbollah organization, and to some extent also by Hamas in Gaza, of shore-to-sea missiles. The Russian made **Yakhont missile system** which was supplied to the Syrians by Russia constitutes a genuine threat and it is believed that it will at some point come into the hands of the Hezbollah.

25 Yedidya Yaari, *Maarhot*, 419, p. 66. [Hebrew]

26 Yedidya Yaari, “Large ships as the solution to a large problem”, *Maarhot*, June 2008, p. 66. [Hebrew]

27 Another missile, fired from the shore at the same event, had sunk an Egyptian commercial vessel M.V. Moonlight in that same incident.

In response to these threats, it is believed that “the best defense is an offense” directed at the enemy’s concentrations of force. Therefore, the Navy would do well to destroy missiles that threaten the gas facilities and other critical infrastructures by attacking the shore batteries from the sea.

A detection and countering system installed on a ship in order to respond to steep-trajectory fire aimed at the gas rigs and other potential threats. The ship would be equipped with anti-missile systems such as a maritime "Iron Dome" and the "Barak 8" missiles and synthetic aperture radar. There have not yet been any reports of accurate sea-to-shore missiles. The weapons of the ship would be armed with stabilized and guided weaponry, such as a surface cannon and the Typhoon Weapon automatic short-range gun system.

Comparison between MAGEN ships and SAAR boats

A comparison of the Navy's acquisition plan for the MAGEN ships to that of the SAAR ships shows differences according to most of the parameters.

Ship size – At sea, there is an economic advantage to ship size. This is the case with respect to both transport of cargo and ship maintenance. The size of ships in the superpower navies is becoming larger and larger. It appears that anyone associated with ship construction and operations is pleased with this trend. A large ship can better endure rough sea conditions and a larger variety of armament systems can be deployed on a large ship. Its commander has a higher rank and it can operate over longer distances. A ship with an impressive size is also meant to deter potential enemies.

In response to the idea that a large ship will sit in the middle of the ocean and “know everything”, it can of course be claimed that a single ship can only be in one place at a time. Having information on all radar targets in the Eastern Mediterranean would simply create confusion. What is needed is precise information in order to achieve certain identification, which will enable the decision to open fire. Concentration of naval power in few ships provides the enemy with targets which if hit would result in a national disaster. In our view, preference in naval warfare should be given to a combination of traits of a single ship multiplied by the quantity of warships on the front line.

Size of crew – The size of the ship's crew is determined by the ship's missions and the weapons systems it operates. It appears that the phenomenon of a crew of hundreds on a sinkable one platform is not an acceptable situation in the eyes of the Israeli public. Following the sinking of the Dakar submarine with 69 casualties, the Gal-class

submarines were designed to operate with about one-third of that number.²⁸ There were 250 crew members on the destroyers and about 40 on the SAAR boats that replaced them. There has been no effort by the Israeli Navy to reduce crew size. There are currently 53 crew members on the SAAR 4.5 missile boats and 75 crew on the SAAR 5 (including a forward crew for the helicopter). The SAAR 6 is meant to have a similarly sized crew.

The national memory of the Israeli people associates the Navy with national disasters, such as the sinking of the destroyer INS Eilat and the aforementioned sinking of the submarine Dakar. The Bible teaches us the story of David and Goliath. The Philistines put their hopes on a huge and deterring hero but nonetheless a single hero, who was surprised by a method of fighting he was not familiar with. The SAAR 6 is similar to a modern Goliath waiting for the appearance of an Arab-speaking David.

The single fighting unit – The reference threat was at first the Skori destroyer which was replaced by the Osa missile boat. The commander of a SAAR knew that in a one-on-one battle he has an advantage with the Gabriel missile over the cannons of the destroyer, and there were deception measures and defenses against the Styx missile. The force structure of potential adversaries nowadays includes a large stockpile of missiles of various types. The "Barak-8" weaponry and anti-missile systems, which are in operational use in the Israeli Navy, preserve the battle superiority of the single warship in the view of its planners.

Reduction of missile capable units – Over the years, the Navy's quantity of warships has declined. If in the mid-1980s the Navy reached a peak of 26 missile-capable units, the current flotilla of missile boats numbers only 11, three less than during the Yom Kippur War. Four SAAR 6 corvettes that are to be added, bringing the Navy up to 15 warships. The replacement of the older ships that are scheduled to retire by the SAAR 4.5 will maintain the quantity of surface missile capable fighting units.

Loss of maximum speed – The Cherbourg boats had a maximum speed of more than 40 knots and a cruising speed of 34. The SAAR 4.5 has a maximum speed of 35 knots and a cruising speed of 30. The SAAR 5 missile corvettes have a maximum speed of 32 knots and a cruising speed of 17. The SAAR 6 MAGEN ships are planned to have a maximum speed of 26.

For reference, the newly ships of the US Coast Guard are built to have a maximum speed of 47 knots and a cruising speed of 40.²⁹

28 Moshe Imbar, *Submerge and Dive*, p. 73.

29 For example, the USS Gabrielle Gifford (LCS-10).

Extension of operational range – A longer range of operation was achieved at the price of reduced speed. The Cherbourg-built SAAR boats maintained a cruising speed of 30 knots and their voyages had consistently been at that speed. Their operational range was 1200 miles. The SAAR 4 and following it the SAAR 4.5 doubled the operational range while maintaining a cruising speed of 30 knots.

The SAAR 5 ships have an operational range of 2500 nautical miles at a cruising speed of 17 knots. The SAAR 6 ships will have an operational range of about 4000 nautical miles at low speed.

Production in Israel – The first SAAR ships were built relatively quickly and inexpensively at Cherbourg. But they became subject to a political embargo. This possibility should be taken into account when building abroad. Acquisition of ships from domestic production enhances the overall naval capabilities.

The SAAR 4 and SAAR 4.5 were built at Israel Shipyards. The SAAR 5 corvettes were built in the US and the MAGEN corvettes are being built in Germany, including partial funding by the German government of one-third of the cost.

It is possible to build large ships in Israel. Israel Shipyards produces missile boats of 70 meters in length for foreign customers. The IN had acquired six "Shaldag" patrol boats from Israel Shipyards and ten Devorah-class ships from Israel Aircraft Industries.

Use of drones – The SAAR boats benefited from aerial support up until the Yom Kippur War and thereafter. The SAAR 4.5 ships were lengthened to accommodate a landing area and hangar for a helicopter. The SAAR 5 was built with its main component being a helicopter whose task it is to detect and identify enemy vessels. The naval helicopter squadron is part of the missile boat flotilla. A naval helicopter is also planned for the SAAR 6 ships.

While Israel is a pioneer in the development and production of drones, a version to be operated from a ship has not yet been developed. Even the accident in which a naval helicopter crashed into the sea in September 1996 for unknown reasons³⁰ did not induce the Navy to change its thinking on this issue.

Conclusion

The Navy obtained a ship that fit its needs when it acquired the SAAR 4.5, which was built by Israel Shipyards. Later, the Navy has focused on the development of

30 Summary of air force accidents at www.sky-high.co.il

various types of less successful ship platforms rather than focusing on development of innovative naval weapons systems.

The four MAGEN ships constitute an addition to the Navy's capability of protecting Israel's shores, including the facilities for the production and conveyance of natural gas.

It would have been worthwhile to direct the investment toward the acquisition of a larger number of ships built by Israel Shipyards.

The need for "many fast boats carrying lethal weapon" is as valid in Israel's current situation as it ever was.

In order to maintain the ability to sail fast and reduce the quantity gap in Missile capable warships, the older ships should be replaced by new Israeli-made SAAR boats, which will be equipped with state-of-the-art weapons systems and which will be operated by a reduced crew.