



## Section Three: Naval power buildup, challenges and lessons from the past

The arrival of the Sa'ar 6-class corvette boats to Israel in 2020 is a significant milestone in the strengthening of Israel's naval forces. The enhancement of the navy is intended to counter the main present-day challenges and bolster the navy's strength, based on past events. Beyond their arrival, these boats symbolize the broadening of the IDF naval missions to areas outside of Israel's exclusive economic waters.

As surveyed in the previous strategic maritime evaluation, the chapters on power building in the present strategic assessment revolve around three central axes: surface vessels appropriate for the Israeli navy,<sup>1</sup> advanced technological topics (including unmanned vessels and their combat operations theory),<sup>2</sup> and building special operational abilities such as amphibious landing capabilities<sup>3</sup> or dealing with naval minefields.

In the area of building naval strength, Ido Ben Moshe describes the central threat references in relation to **defending Israel's gas production rigs** as well as the building of a naval power to respond to these threats and its operational theory. One of the four Sa'ar 6 boats has already arrived in Israel, and is in the process of being integrated and having its weapon systems installed. The process must be completed by building a professional and organized guidance mechanism to protect various maritime facilities in the economic waters of the State of Israel.

Shlomo Gueta writes about the unexpected Egyptian naval minefield in the Strait of Jubal during the Yom Kippur War. The damage to the tanker "Sirius", in service to Israel bringing gas from the oil fields in the Gulf of Suez to Eilat, inflicted by a mine and causing it to sink as well as another mine that damaged the tanker "Serenya", exemplifies the effectiveness of naval mines in imposing a blockade and closing sailing lanes. Much can be learned from past events regarding how to deal with present maritime threats in the area, whether these come from Hizballah in Lebanon, or from terrorist entities in the Gaza Strip, or even further, from the Houthis in the southern Red Sea, supported by Iran, and using naval mines in the area of the Bab al-Mandab Strait.

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- 1 See Eli Rahav, The Sa'ar Boats – The surface combat force of the naval service, Greater Maritime Strategic Evaluation for Israel 2019.20. <https://drive.google.com/file/d/1iu3iMnBMZdXyqHuAQ-4lwGT1UupX5Ej6/view>
  - 2 See Roi Nagler, The challenges in operating autonomous sailing vessels in the globalization era – The case of autonomous merchant ships, Greater Maritime Strategic Evaluation for Israel 2019.20. [https://drive.google.com/file/d/1kC-YMl03\\_E3o5qtXYdv\\_oDzxiuR3nSfj/view](https://drive.google.com/file/d/1kC-YMl03_E3o5qtXYdv_oDzxiuR3nSfj/view)
  - 3 See Benny Shpiner, Fifty years after the War of Attrition – Amphibious landing – Lessons from the past and future challenges. [https://drive.google.com/file/d/1x55zTN6JtJSlIIXPKngxZrHJrFkj\\_cQ-Y/view](https://drive.google.com/file/d/1x55zTN6JtJSlIIXPKngxZrHJrFkj_cQ-Y/view)

An additional survey having a historical dimension yet with significant importance to the present is brought by Yossi Ashkenazi in his chapter on the alternative possibilities that have been discussed over the years regarding establishing **a port in Gaza**, or a pier dedicated for use by Gaza in a port in the area. A port in Gaza involves complex aspects of Israeli security supervision to prevent the Hamas acquiring arms while balancing the economic needs of the two million people living in the Gaza Strip, alongside it being a port where ships from around the globe anchor – a symbol of Palestinian national sovereignty. It would appear that as long as the Hamas regime in Gaza is stable, it is impossible to expect a change in the present situation in which goods and merchandise for Gaza comes in through Ashdod port.

Itsik Bilia writes about a 'MITNOSES' project, the development of an unmanned helicopter for the missile boats of the Israeli navy. The project perhaps was ahead of its time (the end of the 1980s) but today the unmanned and autonomous aerial, and even maritime, vehicle industry is booming. Alongside the complexity of the area of the eastern Mediterranean Sea, and the added missions assigned to the navy along with the need to protect the gas production rigs, the question arises regarding the use of unmanned aerial vehicles by the navy. This is also in light of the fact that the Sa'ar-6 boats that have recently come to Israel are equipped with manned helicopters.

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## Implementing of Maritime Defense concepts for Protection of Israel's Economic Waters

*Ido Ben Moshe*<sup>1</sup>

### Introduction

For the past two decades, the State of Israel has been involved in the development of energy resources in its economic waters. This activity has generated a number of important processes that have a strategic impact on the country and may shape the future and status of its sea within the State of Israel's national strategy.

The importance of Israel's maritime domain has grown in recent years. This calls for multi-dimensional planning and organizational integration that will ensure the achievement of Israel's national goals on the political, security, energy and economic levels.

An energy project on a national scale is a particularly complex endeavor and includes the planning and construction of maritime facilities, production infrastructures and transmission systems (particularly long ones in Israel's case). It requires the evaluation of numerous factors, including, among others, the geographic location of the facility, its effect on the environment and the safety risks that accompany its operation. In addition, it requires an evaluation of all threats, based on an assessment of Israel's security and geostrategic situation. As part of this evaluation process, the central question facing decisions makers is the threshold required to defend and secure the day-to-day operation of the facility from the viewpoint of safety and security. Among the many considerations—and based on the strategic importance of a maritime energy facility for Israel and in consideration of Israel's geostrategic situation—security will carry major weight.

Damage to a maritime facility which serves as an important component in the supply of natural gas to the State of Israel will have implications beyond simply the damage caused since it has the potential to disrupt electricity generation in Israel, which in turn will have adverse effects on economic activity. On top we should note other important elements, such as the economic damage (the cost of repairing the facility) and environmental, perceptual, and commercial damage. In addition, this will lead to a reduction in the deterrence of the IDF and the State of Israel. Maritime facilities in general and those in Israel in particular are already today subject to threats from

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1 This chapter is an updated and shortened version of a paper written by the author in 2010 for the National Security College.

a wide variety of players: nation states, national armies, terrorist organizations, extreme environmental and social activists, hackers and possible even players with economic interests. This list will likely continue to grow in various directions. The character of the threats and their intensity are liable to be highly diverse, and they will have a changing profile over the years.

As a result, the State of Israel, the IDF and the navy have in recent years taken actions to update and modify the strategy for the navy and IDF operations according to the changing geostrategic reality that was created when the Eastern Mediterranean Basin became an essential and valuable strategic zone for the State of Israel. In this context, it should be emphasized that this view is also applicable to other countries in the region who look at the sea as a promising economic resource, some of whom have also implemented that approach in practice (militarily and politically) with the goal of strengthening their position in the Eastern Mediterranean Basin. Their importance, as well as the implications of any damage to the natural gas infrastructures in the Mediterranean, necessitates an evaluation of the risk that the State of Israel may have to deal with in the protection of its economic waters.

In this chapter, we will present an assessment of the progress made so far in the development and revision of the operational concepts that will lead the actions of the Israeli navy and that is required to protect Israel's economic waters, in view of the changes that are developing already at this point in time. These changes will have a decisive impact on the existing security doctrine, which is meant to ensure Israel's sovereignty also in its waters in the Mediterranean. In what follows, we will describe the directions we recommend for policy making in order to provide an appropriate conceptual approach to ensure control over Israel's economic waters and the energy infrastructures located within them. Maritime awareness can provide a future platform for achieving naval superiority in a conflict and a solid basis for the development of a grand maritime strategy for the State of Israel.

### **Maritime elements of the national security doctrine**

To the extent that it is possible to predict, the nature of future wars and conflicts will continue to change; nonetheless and despite the lack of certainty with regard to the nature of a future conflict, it is possible to identify certain trends based on the arms acquisition and buildup of power among Israel's enemies. It can be assumed that also in future wars, the resilience of the Israeli home front will be tested to a great extent and the economy's infrastructure and population (the civilian home front) will serve as a target for missiles and rockets. As part of the process of evaluating the intensity and quality of the overall threat (land/air/other) to the energy infrastructures in the

Mediterranean, it is worth considering a number of unique characteristics that affect the regional balance of power and deterrence to a great extent. The main claim that we wish to present to the reader is that the development of the offshore natural gas sector constitutes a "change in reality" that requires major policy revisions on a national level.

**The geographic dimension** – Until a few years ago and since the establishment of the State, Israel has assigned importance to its maritime sovereignty and has used the navy to ensure control over its territorial waters, without any special emphasis on the issue of its economic waters. Although over the years the navy has operated far out at sea, the character of this activity was focused on a specific operational mission, rather than routine security activity, and without any permanent presence far out in Israel's economic waters.

The economic waters are a large maritime expanse that will be added to Israel's waters after the approval of the Maritime Zones Law.<sup>2</sup> The importance of this area is a direct result of the natural resources and energy infrastructures located within it. This calls for Israel to ensure its control over this area and its defense.<sup>3</sup> The physical size of the economic waters is somewhat larger than Israel's total land territory. This is a large expanse of sea, which is distant from the coast and as a result the ability for civilian governance is limited there. Similarly, the possibilities for military activity (maritime awareness: deterrence, response, a control network and "constructing a picture"<sup>4</sup>) are limited due to the reliance on coastal infrastructures and ocean-going vessels.

**The dimension of surprise** – The strategic change that has occurred in the enemy's strategy to defeat Israel has led to discarding of the idea of Israel's conquest and destruction while at the same time the Israeli home front has become the primary target for aggression. This is part of the intention that major damage in the home front will lead to attrition that will "break" the State of Israel. This approach continues

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2 Proposed Maritime Zones Law, 2017. <https://main.knesset.gov.il/Activity/Legislation/Laws/pages/LawBill.aspx?t=lawsuggestionssearch&lawitemid=2022714>

3 There is a gradient of a coastal country's sovereignty and responsibility, beginning from its territorial sea, to its contiguous zone and finally its Exclusive Economic Zone (EEZ). The sovereignty in the EEZ is limited primarily to the exploitation of natural resources (and other elements) as described in the United Nations Convention for the Law of the Sea (UNCLOS, 1982). Israel is not a party to this covenant (which it has not signed), but has declared on a number of occasions that it will fulfill the policy of the Convention and its instructions.

4 The operational process that characterizes the detection and classification of maritime targets, up to the ability of tactical presentation, exploitation and information generation.

to motivate the intensive buildup of power based on missiles and rockets in the intermediate and long run (an effort that is seeking greater and greater precision and destructive power). This threat and the strategic importance of the offshore infrastructures to the State of Israel, in our opinion, make the scenario of a first strike as particularly feasible and attractive in the eyes of Israel's rivals. The continuing improvement in the range of missiles and rockets and the large-scale efforts by Syria and the Hezbollah, with the support of Iran, to achieve precision in a missile strike means that a maritime facility becomes an optimal target for a surgical strike. This will be achieved with only a small loss of civilian lives,<sup>5</sup> but will provide Hezbollah (or Iran) with a victory picture and will cause decisive damage to the home front, to the Israeli economy, to the national morale and to the ability of the population and the economy to endure crisis situations.

**Greater asymmetry between Israel and its neighbors** – The maritime facilities exacerbate the lack of balance between Israel and some of its neighbors. Already at this point in time, the disparity in GDP per capita between Israel and its neighbors is almost unbridgeable. The maritime facilities make Israel more vulnerable to its enemies in terms of energy security. It creates a lack of equilibrium on the basis of maritime borders<sup>6</sup> and Israel's existing energy reserves. The development of advanced infrastructures for oil and gas exploration by Israel's neighbors—and primarily Lebanon—is in the future liable to improve the balance of threats from both sides of the maritime boundary.

**The strategic home front, deterrence and sources of friction** – In recent years, the maritime domain has become a direct source of friction and confrontation. Over the years, the uniqueness of the maritime domain has been manifested in the absence of any major threat. The sea was a domain in which activity was not subject to threats arising from the friction and close proximity that characterize Israel conflicts on land. This reality is very different today. Currently, a large part of the maritime arena is threatened by coast-to-sea missiles which can be deployed on command, or alternatively with the start of fighting, at launch position in Lebanon and Syria.<sup>7</sup> In the existing reality, the maritime domain and its boundaries are liable to become

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5 The number of workers on a maritime facility of intermediate size (such as the Tamar rig) is limited (about 30 to 40 crew members).

6 Yedidia Yaari, "The Naval Arm 2000 – Challenge and Response," *Maarachot*, Volume 368. [Hebrew]

7 For example, the attack on the Israeli naval vessel Hanit by an Iranian-made coast-to-sea missile at the beginning of the Second Lebanon War in July 2006.

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a focus of confrontation between countries in the region, including Israel, Lebanon and Turkey.

Deterrence – In view of the lack of regional stability, deterrence is a primary factor in creating restraint in the Middle East. An attack on a maritime facility will constitute a serious attack on Israel's deterrent ability and will be classified as a legitimate attack on civilian infrastructure. Such an attack is probably liable to be considered legitimate also by the opinion of the international community.

**The regional dimension** – In recent years, we have been witnessed to an intensifying and uncompromising confrontation between Turkey and Greece on the question of the boundary between their economic waters. This followed a unilateral and blunt declaration by Turkey and Libya that is not within the lines of international law.<sup>8</sup>

The demarcation of a boundary for economic waters in the Mediterranean has regional, political and diplomatic significance and disagreement in this context can drag the region into a conflict. The phenomenon of cross-alliances between the region's states and the limited involvement of the international community and the US are liable to undermine the already frail situation of regional stability and in the end could bring about a regional war.

Israel needs to declare an economic zone that rests on the legitimacy of international law and is supported by regional economic interests. This will be accomplished by the legislating of the 'Law of Maritime Zones' and the demarcation of its maritime boundaries with its neighbors.

In this context, and in the spirit of the normalization agreements that have emerged in recent months with some of the Persian Gulf states, (Abraham Accords), it will be necessary to more energetically promote cooperation with the "dialogue" states in the Eastern Mediterranean: Israel, Egypt, Greece and Cyprus. What is needed is cooperation based on dialogue and an overlapping of civilian-diplomatic interests in areas such as energy. This is a discourse with the most profound potential and significance. In our view, academic bodies can play a role in promoting initial contact, based on research activity and identical or intersecting interests.

The growing Chinese influence in the region, alongside Iranian, Russian and Turkish attempts to establish a stronghold in the Eastern Mediterranean, require constant assessment of the situation with respect to the effect of these efforts on the maritime domain – Israel's western border. In addition, the assessment is necessary

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8 An agreement with the Government of National Accord (GNA) signed in November 2019.



in order to monitor the military forces of these countries and their operational policy and routine, alongside unexpected acts that undermine regional stability or that endanger one or more of Israel's interests.

In concluding this section, the sea as Israel's strategic depth is to a large extent an asset in flux. The eastern basin of the Mediterranean has been transformed from an unthreatened zone of strategic depth to part of the threatened and sensitive strategic home front, which is liable to become a direct source of confrontation. This is a domain subject to continual threat which requires that Israel significantly strengthen its control over it.

### **The security doctrine with respect to the economic waters and the maritime facilities**

The military response to the threat in the maritime domain is based on four main principles:

1. The definition of threats and reference scenarios.
2. The buildup of power.
3. The use of power.
4. Command and control.

In addition, it is possible to divide up the security doctrine according to two levels: the tactical level which relates to a limited area in the vicinity of a single facility and the strategic discussion on the level of the maritime domain as a whole.

### **Defining the threats and the reference scenarios<sup>9</sup>**

In order to define the reference scenarios, it is necessary to first analyze the existing security threat. Clearly, a detailed intelligence evaluation is needed, as well as a continuous analysis of the capabilities of rivals and regional players and the trends in their buildup of power. Even so, it is possible to analyze the spectrum of threats (kinetic and otherwise) to the offshore facilities, which include the following, among others:

**A surface threat from the sea:** Fire from a ship, an intentional ramming by a ship, a suicide attack, a hostile takeover.

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9 This section deals primarily with military threats; however, there are also scenarios that include accidents and safety events. For further details, see the section below on rescue and repair capabilities.

**An underwater threat:** Sabotage by divers, torpedoes fired from a submarine.

**Aerial threat:** Suicide attack, drones, aerial attack by a conventional air force.

**Missile and rocket threat:** Including fire from precision or statistical weapons (which can be executed from the land, the sea or even the air).

**Cybernetic threat:** An attack or disruption of the rig and infrastructure by means of a cyber attack.

### ***Guiding principles in the protection of the overall maritime domain***

**Intelligence, deterrence and interdiction:** Intelligence-gathering capabilities will be based on ships and aerial vehicles out at sea, as well as on coastal facilities. The use of forces in the economic waters will support a response and interdiction capability even without an intelligence warning.

Deterrence is based on the use of land forces, naval forces (both above surface and below surface) and aerial forces in the Exclusive Economic Zone (EEZ) and beyond it by means of routine patrols for the purpose of demonstrating a presence and projecting power, gathering of intelligence, constructing a maritime picture and protecting the maritime domain and the assets located in it.

**Search, detection and identification:** The navy will employ special advanced systems for the purpose of detecting, identifying and following targets on the surface (ships), submarines (anti-submarine capability) and also the various aerial targets (planes, drones, armaments). This activity will be managed by a maritime command center at the naval headquarters and will be based on the navy's command and control infrastructures (satellite communication networks, full connectedness, sharing of information and work on a network).

**Attack and interception:** Naval forces will carry advanced detection and identification systems. The forces will have attack and interception capabilities to be used against targets in the air, on the surface and below surface. Command and control abilities are based on broadband communication and connectedness with detection and warning systems on land that will enable the identification of a threat and a rapid response to intercept it or alternatively to severely disrupt it. Already today, the "naval dome" system makes it possible to intercept aerial threats from the deck of the Sa'ar 5 class ships. This capability is likely to be strengthened by the ability to intercept missiles and/or rockets possessed by the 'Hamagen' ships (Sa'ar 6 class) which are currently under construction in Germany. This capability will be based

on various defense envelopes that include means for aerial interception, electronic warfare systems, etc.

**Rescue and repair:** The forces operating in the area need to have rescue and repair abilities in order to provide a response during an emergency, in the case of accidents and in safety events, such as a fire at the offshore facility or an environmental disaster.

**Availability:** The forces operating in the area need to maintain a high level of operational readiness and an ability to provide a rapid response to developing crisis situations. Their vessels need to have the ability to remain at sea for a long period and under constraints of weather, supplies, etc.

### *The rules of engagement*

A policy will be decided upon for the use of force in normal times and in an emergency, according to the development of a military doctrine that will determine procedures, inter-corps coordination, means of control etc.

### **Buildup of capabilities**

Already at this point in time, the navy is in the process of a broad buildup of capabilities that includes the construction of surface vessels and the addition of a submarines from Germany. The design of the Sa'ar 6 class surface ship was adapted to provide the ability to monitor and comb a broad expanse of sea. The naval forces, the types of platforms and other components have been adapted in order to deal with the reference scenarios described above, with the goal of protecting the national assets that are dispersed geographically throughout Israel's economic waters.

The achievement of maritime control in normal times and naval superiority in times of conflict is a necessary condition for the navy being able to defend Israel's economic waters. Therefore, the preference in the buildup of the navy's strength should be given to the forces that are essential for the achievement and maintenance of naval superiority.<sup>10</sup> This is in addition to the surface forces, including the buildup of the navy, the production and acquisition of advanced aerial patrol platforms and the expansion of the coastal detection network, with the goal of controlling the "surface" and also selected underwater zones.

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10 Shlomo Ariel, "The Sea as Strategic Depth" *Maarachot*: Ministry of Defense, volume 388. [Hebrew]

Surface vessels will be the main force operating to protect the economic waters. They will manage the control of the maritime space and will constitute the main firepower in meeting the aforementioned threats. Until a few years ago, the navy only operated outside of its territorial waters as part of its operational activity or to secure essential shipping lines during a war. Already at this point in time, the navy is required to maintain continual control of Israel's economic waters, including the shipping routes leading to and from the ports of Israel. To this end, it operates an integrated configuration of surface vessels, aerial patrol forces and submarines, alongside technological means of detection, identification and classification of the various threats. Following are the main systems required to carry out these missions:

**Surface platforms:** Ships comprise the basic strength of the navy. This platform enjoys various capabilities that are derived from its main characteristics, such as size, the types of weaponry on its deck, its ability to carry a helicopter, its sailing range, its maneuvering ability, its ability to remain at sea for long periods, etc.

The ships that will be required to provide an effective defensive response must have a number of capabilities: detection capabilities that include a multi-purpose radar coverage of the sea and the air for a radius of about 200 nautical miles; a system on the ship for submarine detection; and an ability to identify targets by means of aerial vehicles (helicopter / unmanned helicopter / a patrol plane).

The ships will be armed with defensive systems for the protection of the ship itself and also offensive weaponry that include sea-to-sea missiles, a sea-to-air missile system and a torpedo weapon system against submarines.

The ships will have the ability to remain at sea for a long period and will have high maneuvering ability. In order to ensure all of the aforementioned capabilities, the ships will need to be large, it will need to have a large displacement and a high degree of stability and it should have a weight of between 2500 and 3000 tons.<sup>11</sup> This is indeed the size of the ship that the navy has chosen. Four ships of this type are currently being built at the Arge<sup>12</sup> shipyards in Kiel, Germany. This ship will serve as the forward point in the defense of Israel's EEZ and will have capabilities to monitor a vast sea and air expanse, alongside fire capabilities. The ship's capabilities will facilitate full maritime and aerial control and monitoring, including the operation of various aerial systems, such as a sea helicopter that will take off from the ship's deck.

11 Yedidia Yaari, "Large ships for a large problem", *Maarhot*: Ministry of Defense, Volume 419, 2019. [Hebrew]

12 An organizational framework established for cooperation between the German TKMS and GNYK shipyards.

It will be able to stay in the air for an extended period and will provide improved tactical capabilities for constructing a the "combat picture", as well as having warfare capabilities. The activity of the ships will be reinforced and accompanied by drones with autonomous capability, which will be controlled from the coast or from the sea and will be equipped with advanced systems for constructing the "combat picture" – detection, identification and tracking. The aircraft will allow for extended missions, full presence under almost any weather conditions and a large operating range. This buildup of power will boost the navy's current strength and will reinforce its existing capabilities, while facilitating a decisive role for the navy also in supporting the army and the land combat in the future.



Figure 1: Israeli Navy Ship INS MAGEN docks at the shipyard in Germany, November 2020, (IDF spokesman)

**Submarines and underwater vessels:** The submarine is already an important part of the maritime arena. Its operational abilities, which are directed toward its offensive capability, can be exploited for the protection of the economic waters. The ability to operate clandestinely and its acoustic detection capability constitute a major advantage in maritime warfare. These characteristics can serve as deadly weapons against an underwater threat and in particular against enemy submarines. A submarine can be used as part of an ambush in areas where the enemy is expected to operate.

The employment of a submarine in the defensive operations of the Israeli navy will be translated into deterrent ability. Also, in this case, the inventory of submarines should be a dominant component in the ability to manage optimal maritime control in the economic waters, which will strengthen Israel's deterrence.

**Fast-moving boats for interception and attack; surface vessels:** The abilities of the task force will be complemented by small and speed craft whose mission will be interception and attack of threatening targets. These vessels, as in the case of patrol vessels currently in use along the coast, will be characterized by speed of response, firepower, high speed and a small and streamlined crew.

**Vessels to provide techno-logistical service and response, rescue and firefighting ability:** There is a need for ships that will technologically and logistically support the various systems that operate in the maritime space, such as providing fuel, water, food and technical support (repair and spare parts). In addition, these ships will provide a first response to an emergency such as a fire on the production facility, a serious accident or an environmental event (see below for details on the management of a safety event).

## Use of Force

The change that has occurred in the geographic domain and the strategic threat (from the sea or the air) to the EEZ and the facilities located in it creates the need for a response that will ensure the security of the economic waters and thereby control of the maritime space and will deny freedom of action to an enemy navy or a terrorist group.

In an emergency, the navy will need to ensure maritime superiority, similar to the air superiority enjoyed by the air force. To this end, the navy is seeking to achieve early detection of an enemy in wartime and the ability to destroy his forces as quickly as possible. However, in order to protect Israel's economic waters in peacetime, when there are enemy forces or civilians located in the theater, and when there is also commercial traffic through the economic waters, the navy must maintain patrols and a deployment that will itself enable the interception and destruction of any enemy force that is detected.

The use of the naval forces will, as mentioned, achieve control over the economic waters and provide the ability to track all maritime activity in the arena. The use of naval forces in the domain will be on a continuous and routine basis and will provide an immediate response to the various threats. In an emergency, the deployment will be reinforced and there will be continual patrols near essential facilities, according to the reference scenario. Naval forces will have support from the coastal units and the aerial patrol operations. These will create an intelligence picture in the maritime space – layer by layer.

Deployed on the facilities themselves will be a security force with defensive capabilities and the ability to fight independently against an attack of small craft, takeover attempts and divers who threaten the facility. The tactical response will provide protection in the immediate vicinity of the facility. This will be a military/civil force that will be responsible for protecting the facility against direct focused attack, whether by terrorists, pirates or some other groups. The force will be located on the rig and will be equipped with electronic and optical detection systems that will monitor the approach of various vessels that might represent a danger to the facility. The force will be independent and will operate under the command and professional direction of the navy.

### *The intelligence picture and the maritime picture*

Maritime control is a military-professional concept which expresses the ability to monitor a defined maritime space on a permanent and continuous basis. This is based on "constructing an intelligence picture" whose output makes it possible to identify, supervise and control all of the activity in the maritime arena on a continuous basis.

There are numerous vessels operating in the sea simultaneously: commercial ships, passenger ships, fishing boats, research vessels, yachts and also warships of the various navies. In the aerial space, there are civilian and military aircraft and under the surface there are submarines. The ability to create Maritime Domain Awareness that includes an intelligence picture is the ability to recognize and identify the vessels operating in the maritime domain and to categorize them accordingly, with the goal of identifying unusual / enemy / offensive activity. Activity of this type requires continual monitoring the defined arena of activity, intelligence coverage capabilities and the ability to monitor and analyze the maritime arena in real time. The control of the maritime domain will prevent a tactical threat to the offshore energy facilities, will deny freedom of action to terrorist groups, and will track the navies of Israel's enemies in the EEZ. This activity requires advanced abilities for constructing a "status report" based on the abilities of the naval forces combined with aerial patrols. Such control can be accomplished by a deployment of forces in the maritime domain that will facilitate the interception and destruction of a detected threat.

In the context of constructing an intelligence picture, it is also worth mentioning the satellite segment. In recent decades, there has been significant progress in the use of satellites to monitor large areas. Advanced technologies that have matured during the past decade include satellite systems with various capabilities that make it possible to upgrade the process for constructing an intelligence picture, as described above.

Examples include Synthetic Aperture Radar (SAR) and the Automatic Identification System (AIS).

## Command and Control

Command and control of the maritime domain, which includes economic waters, needs to be technology-based and should include capabilities to monitor the sea surface, the air (radar and satellite) and the sea depths (systems for detecting submarines and/or divers). In the past, the navy has used radar and coastal facilities to monitor the sea surface. The new geographical areas that the navy needs to monitor have been expanded to include Israel's economic waters.

A new zone has been created which will be monitored by the navy, supported by its use of aerial patrols. In this zone, which will be known as the maritime warning zone of the economic waters, intelligence will be monitored and assessed, including a continual tracking of military and civilian activity, whether in the sea or in the air.

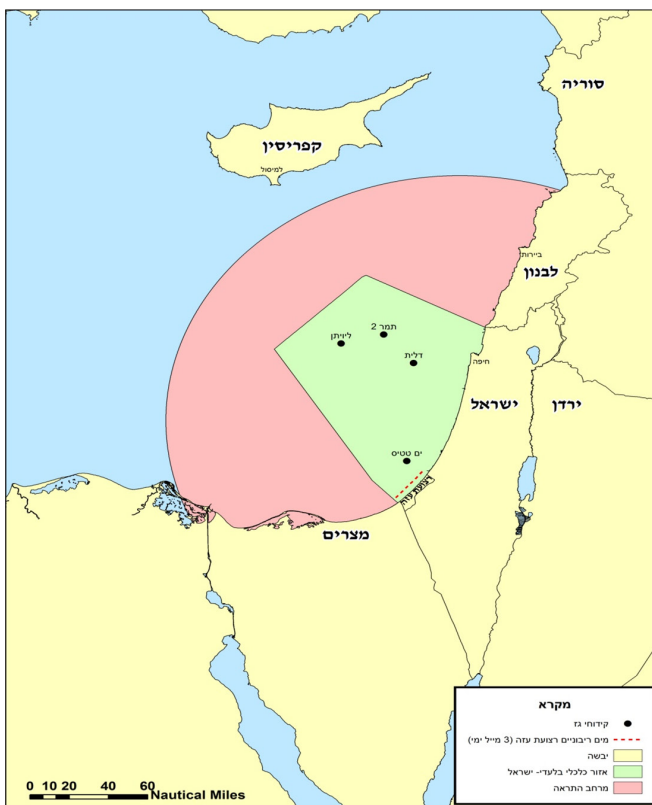


Figure 2: Map of the economic waters and the maritime warning zone



The new zone is broader than the economic waters and will also cover areas that are not part of Israel's EEZ. Within the EEZ, the areas around the facilities that have been designated according to international law are clear of any target or movement (no-sail zones).

The navy has established command and control positions, as well as operational and other procedures, that enable the inclusion of government bodies with an important role in protecting and monitoring the economic waters. It is important to establish a hierarchy and to define responsibilities together with the government ministries that have an interest in this domain, such as the Ministry for the Protection of the Environment, the Ministry of Agriculture, the Ministry of Energy, the Ministry of Transportation, the Ministry of Justice and others. The division of responsibility and authority should be anchored in legislation which will formalize the framework of cooperation between the IDF and the rest of the government bodies. Such cooperation is important both in normal times and during an emergency, as well as in the case of an accident or safety event that occurs at the facilities (such as the responsibility for rescue forces).

Currently the 'Yam Thetis', 'Tamar' and 'Leviathan' natural gas rigs (and soon also 'Karish') are under a civilian security umbrella that operates in cooperation with the navy, as part of Government Decision 85/b. This decision, which was made in 2003, instructs the IDF to include the 'Yam Thetis' facility within its routine security activities. The decision also specifies that the Prime Minister will appoint the organization that is responsible for the physical security of the facilities. Currently, the IDF is responsible for maintaining its role as the controlling military force in the maritime domain. To this end, the navy will designate the essential facilities and infrastructures within the areas of its security responsibility. In this capacity, the navy will constitute the professional authority in the protection of the facilities and infrastructures against the threats presented in the reference scenarios. The professional instruction of the security of the facility itself is also the responsibility of the navy. Other responsibilities in the economic waters include: safety, quality of the environment, cyber, etc. which are necessary for the routine operation of the facility and its infrastructure according to its purpose and subject to the standards that apply to its operation. The role of the National Cyber Security Authority in providing professional guidance and in the analysis of the cyber threat is essential given the development of these threats to similar facilities and infrastructures around the world.

The activity of the naval forces, the various intelligence -gathering systems and the control and information systems will provide the various government bodies

with the means to enforce Israel's authority in the EEZ. This will be instrumental in strengthening the sovereignty and national resilience of the State of Israel and particularly in the maritime domain.

## **Conclusion**

The navy and the IDF will in the next few years complete a broad strategic acquisition program that is intended to provide a response to the challenge of protecting Israel's strategic assets near the coast and out at sea.

This program will not be complete without a number of additional and important processes, including the achievement of agreement on maritime borders, the legislating of the Law of Maritime Zones, the strengthening of the alliances and relationships with the other Eastern Mediterranean states and the creation of an organized and professional mechanism that will manage the protection of the various maritime facilities in Israel's economic waters.

## The Egyptian Sea Mining Surprise during the Yom Kippur War (October War 1973)

*Shlomo Guetta*

### **preface**

in the context of the wars between Israel and the Arab armies, offensive sea mines were first used during the Yom Kippur War (1973). At that time, the Egyptian navy made use of this weapon by mining the important chokepoint in the Straits of Jubal at the southern opening of the Gulf of Suez.

The decision to use this weapon in that region, which is an international shipping route, was ideal from the Egyptian perspective who did not want to violate international law. In this context, it is worthwhile quoting Admiral Fouad Mohamed Abou Zikry in a lecture he gave in 1975 in Cairo on the second anniversary of the Yom Kippur War: "The regions near to the enemy defenses and which can be exploited to intercept sea routes such as the entrance of the Gulf of Suez are suitable for the use of sea mines which are a dangerous and effective weapon particularly if accurately used against an enemy that does not have the means of disposing of them."<sup>1</sup>

The free traffic of ships to and from the Gulf of Suez was essential to Israel for both the passage of military vessels and the transport of crude oil. Due to the blockage of the Suez Canal at the time, the Gulf itself was a kind of internal sea that served only Israel and Egypt (namely, without a threat to a third party or a neutral party). This characterization was evident to the planners in the Egyptian navy and served as a convenient opportunity to make the first use of offensive sea mines, which were highly significant on the naval battlefield and which had a large number of advantages:

- The ability to conceal the existence of the mines and to cause damage to vessels unexpectedly.<sup>2</sup>

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1 From a lecture by the commander of the Egyptian navy, page 113 in the symposium's collection of lectures.

<https://archive.kippur-center.org/arab-sources/lecture-admiral-abu-zikri-1975-new-eng.pdf>

2 Indeed, Israel did not know about the mining activity and was taken completely by surprise by its existence.

- Sea mines are placed where enemy ships are used to passing though or must pass through, such as the main shipping routes, rivers<sup>3</sup> or straits, in a way that disrupts the enemy's shipping traffic.
- In addition to the damage caused, the mines also have an important psychological effect: one mine located on a civilian shipping route is liable to halt traffic until the area has been swept and the mines removed.<sup>4</sup>
- Sea mines are a very efficient weapon in terms of cost-benefit and thus are particularly attractive to the weaker side in a conflict. The cost of producing and laying a sea mine is negligible in comparison to the cost of removing it and disarming it.
- The time needed to neutralize and dispose of a field of sea mines can be 200-fold the time needed to lay it.<sup>5</sup>

It can be assumed that the Egyptian strategy to use offensive mines was primarily based on naval warfare doctrine developed during the Second World War, as well as the inspiration of Soviet doctrine and the massive supply of Soviet weapons provided to Egypt, which included a variety of sea mines produced in the Eastern Bloc.

The goal of this chapter is to shed light on the actions of the Egyptians, which achieved complete surprise, as part of their naval strategy. This pattern is liable to be repeated by other enemies in future warfare scenarios, since offensive sea mines are intended to achieve naval control of the enemy's ports and at essential chokepoints.

## Introduction

On the morning of October 26, 1973, about two days after the ceasefire that ended the Yom Kippur War went into effect, two large explosions broke the quiet of the peaceful waters in the southern Gulf of Suez. These occurred under the hull of an oil tanker named 'Siris', which was sailing through the 'Straits of Jubal' on the eastern side of the strait, on its way from the port of Eilat, with the goal of filling up with oil from Israel's oil fields on the eastern side of the Gulf of Suez.

The Siris was a tanker of about 50 thousand tons in Israel's service and together with other tankers operated during the period that preceded the war on the route

- 3 In the years prior to the Yom Kippur War, the Gulf of Suez had the characteristics of an internal sea that served the two enemy nations – Israel and Egypt.
- 4 Israel was lucky that it was able to quickly prepare an alternative route near the Straits of Jubal.
- 5 To illustrate, the mining of the Straits of Jubal took only a few hours on each of 3 or 4 nights during the war. In contrast, the clearing of the mine field by the Soviet navy took a number of months during the second half of 1974.

between the Gulf of Suez and the Gulf of Eilat. It transported crude oil from the area of Abu Rodes/Abu Zanima to the oil terminal belonging to the Europe Asia Pipeline Company (AEPC) in Eilat.

The huge explosions below the tanker were caused by two powerful mines containing between 350 and 500 kg of explosive material (depending on the type of mine). The tanker sustained heavy damage and it was necessary to evacuate the crew by means of air force helicopters. As a result of the explosions, 27 crew members were injured, three of them seriously. Following the rescue, the tanker sank a short time later into the waters of the Straits of Jubal.



Figure 1: The sinking Siris tanker



Figure 2: The evacuation of the crew of the Siris by Israeli air force helicopters



Figure 3 and 4: Closure – After the war, Dan Nakdimon, the captain of the Siris, sailed through the Suez Canal, which was opened to ships in June 1975. In one of the voyages, he met an Egyptian pilot in the canal who was wearing a war decoration on his jacket. Nakdimon asked him what it is for and he answered that he had been with the forces that mined the canal, among other locations, and had caused the sinking of the Israeli tanker in the Straits of Jubal. For that, he was invited to receive the decoration from President Sadat. Of course this was a surprising and emotional encounter between the "victim" of the mines and one of their layers. The two shaking hands. (Photos generously provided by Captain Dan Nakdimon).

This event was the first indication for Israel, that the Egyptian navy had mined the Straits of Jubal at the entrance to the Gulf of Suez at the beginning of the war.

The laying of sea mines by the Egyptian navy was a complete surprise to the Israeli navy and its intelligence department.<sup>6</sup> This type of operation was not foreseen, unlike most of the other tactics used by the Egyptian navy during the war and which naval intelligence had correctly predicted. The surprise was so complete that during the day following the explosion there were still doubts as to whether it had been caused by a sea mine.<sup>7</sup>

The Straits of Jubal are an international sea passage, which is about 7 miles (about 13 km) wide and which have a relatively shallow depth (between 30 and 80 meters). East of the Straits of Jubal and near the western shore of the Sinai Peninsula, is an internal passage called the 'Milan Passage', which is about 2 miles (about 3.7 km) wide and about 14 meters deep at its center.

Although the mine incident was a surprise, within a short time the Israel navy responded by issuing special procedures and an emergency format of operations, which were meant to facilitate and improve maritime traffic and navigation in the Milan internal passage, so that large ships like oil tankers would be able to sail through it. In this way, the mine field that had been laid in the Straits of Jubal was bypassed and the transport of crude oil from the oil fields in the Gulf of Suez to the Port of Eilat was renewed.<sup>8</sup>

The Egyptians knew that Israel had no capability to dispose of sea mines; however, they quickly realized that traffic was flowing through the Milan Passage and starting at the end of October, they tried unsuccessfully to extend the mine field to include the Milan Passage.

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6 In an article written after the war by Colonel Luntz (later a brigadier general), the head of the Naval Intelligence Department, he admitted that the sea mining operation by the Egyptian navy was a surprise. Article in the book "War Today", *Maarachot*, p. 395. See also the book "A Furrow in the Sea" by General Benny Telem who was commander of the navy during the Yom Kippur War, page 221.

7 In the morning following the sinking of the tanker, Captain Nakdimon was brought for a debriefing to a forum of senior officer at naval headquarters. The forum was led by General Telem, the commander of the navy. According to Nakdimon's testimony, there were doubts among the forum that indeed this was a case of sea mines. However, he managed to persuade General Telem to halt the voyage of the *Petria*, the sister tanker, which was at that time about to cross the Straits of Jubal on its way to the Gulf of Suez. <https://bit.ly/396VJGe>

8 For further discussion of the emergency format put in place by the Israeli navy in the Red Sea theater, see "Voyages of my Life", by Zeev Almog, Volume II, pp. 900–901.

Two weeks after the sinking of the *Siris*, on November 10<sup>th</sup>, 1973, another tanker, named the '*Sirenia*' which was under Israeli service, was damaged southwest of 'el-Tor' while on its way with a load of oil from the Gulf of Suez to the Port of Eilat. The tanker was only slightly damaged and after an inspection of the damage and a short delay in the el Tor marina it continued on its way to the Port of Eilat.<sup>9</sup>

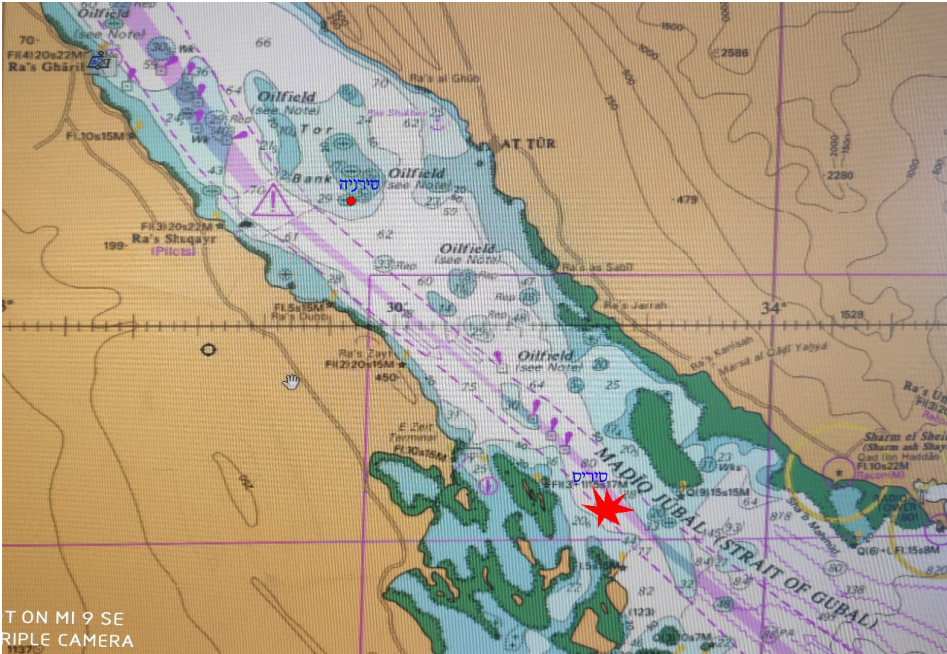


Figure 4: Schematic description of the location of the mine explosions in the two incidents (one in the Straits of Jubal and the other southwest of the el Tor marina)

## The intention and the plan

Based on an analysis of the available information, some of it retrospective, it appears that the Egyptian navy in the Red Sea theater had been planning to lay sea mines in the southern Gulf of Suez for a long time. From the Egyptian navy's perspective, the mission was operationally and tactically well within their capabilities, considering the size of its force and the weapons it had possessed since the 1960s, including in the Red Sea theater.

From the perspective of the Chief of Staff and the senior political echelons in Egypt, the mission was strategically important and was assigned to the Egyptian navy. This

9 The testimony of Captain Yaakov Herzog. <https://bit.ly/2Klfakb>

mission complemented the naval blockade in the central and southern Red Sea and therefore was important in carrying out the strategy of the senior political and military echelons.<sup>10</sup>

Since the Six Day War (1967), Israel had been in control of the "oil corridor" on the east bank of the Gulf of Suez, in an area known as 'Ras Sedr' and 'Abu Rodes'. To the chagrin of the Egyptians, Israel was producing crude oil there and transporting it in tankers to the oil terminal in Eilat.

This mission, like others assigned to the Egyptian navy prior to the war, was planned in the naval headquarter. The planning was led by Fouad Mohamed Abou Zikry, the commander of the navy, and his head of operations, Ashraf Raafat. The latter was the commander of the Red Sea theater in the 1960s and he was familiar with the area. He formulated an operational plan that included both a naval blockade in the central and southern Red Sea and the mining of the Straits of Jubal.<sup>11</sup>

As mentioned, the Egyptians knew that Israel had no capability of neutralizing or disposing of sea mines. The Egyptian navy on the other hand had been equipped since the 1960s with a variety of sea mines produced in the Eastern Bloc: seabed mines and anchored mines, induction mines (with acoustic/magnetic mechanisms) and contact mines. In addition, Egypt had a variety of minelayers and minesweepers, which they had used extensively in training for the laying and removal of mines. Therefore, it was only logical for the Egyptians to make use of offensive sea mines for the first time in a war against Israel.

With respect to choosing the location for the mines, in retrospect it can be said that the choice of the southern Gulf of Suez was indeed the result of sensible operational considerations from the perspective of the Egyptians. Although the Straits of Jubal are, as mentioned, an international waterway, in those days, when the Suez Canal was blocked to traffic of any kind, the Gulf of Suez was essentially an internal sea used only by Israel and Egypt, without any fear that mines in the Straits of Jubal would harm ships other than those in the service of Israel or of Egypt itself.<sup>12</sup> This is

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10 In this context, see the book by el Gamasy, who was the head of operations in the Egyptian army prior to and during the war; page 188 (translated into Hebrew).

11 In an interview with Ashraf Raafat in October 2012, he explained the considerations that guided him in planning the naval blockade of the Red Sea. For readers of Arabic. <https://www.elbalad.news/287297>.

12 In reality, and despite the tracking and supervision by the Egyptians in the case of ships in their service, a Greek tanker named the Maripela was damaged by a sea mine in that same minefield. Zeev Almagor, *My Life's Voyages*, p. 900.



in contrast to the Straits of Tiran, which were also used by Jordan on the way to and from the Port of Aqaba, and the Bab el Mandeb Strait, which was an international waterway used by many countries and first and foremost the countries on both sides of the Red Sea and many third-party countries, including navies of the superpowers.

Another advantage of mining this area is that the waters of the Gulf of Suez, including the Straits of Jubal, are shallow (30 to 80 meters) relative to the deep waters of the Straits of Tiran and the Gulf of Aqaba. This had operational significance since it was possible to also make use of KMD-500 Soviet-made seabed mines which the Egyptians possessed, which had a maximal depth of 55 meters, and also the KB-KRAB anchored mines whose maximal depth is about 300 meters.

From an operational standpoint, it is clear that the Egyptian planner, Ashraf Raafat, the head of naval operations, and Commander Fouad Abou Zikry, viewed sea mines as a complementary component to the naval blockade in the central and southern Red Sea. From their perspective, the mines were meant to prevent the transport of crude oil from the "oil corridor" in the Gulf of Suez to Eilat, while the naval blockade in the southern and central Red Sea (using submarines and destroyers) was meant to block the shipping of crude oil to Eilat from the Persian Gulf.

In an article in 1998, the head of operations of the Egyptian navy wrote that although the goal of the sea mines was primarily to disrupt the transport of oil from the Gulf of Suez to the Gulf of Eilat, it appears that in retrospect it added another important argument, in his opinion, in support of the mission, namely that it would prevent the Israeli navy from carrying out tactical landings, as part of a limited operation, on the western side of the Gulf of Suez, as indeed occurred in Operation Raviv (September 1969 during the War of Attrition). Therefore, according to him, "It was decided mainly to depend on sea mines to block the entrance to the Gulf of Suez."<sup>13</sup>

### **Preparations for the mining laying operation**

Once the decision had been made at naval headquarter to lay the mines and the planning had been completed, the operation was assigned to the Red Sea headquarters at 'Safaga' and the forward 'Hurghada' base. It is unclear when exactly the preparations for the mission began, but it can be assumed that it was during the first quarter of 1973.

It is worth mentioning that during the period prior to the war, the Egyptians had two types of vessels in the Red Sea theater that had the technical ability to lay sea

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13 Article by Ashraf Raafat in 1998: p. 80, at the following site. <https://bit.ly/395EViT>

mines. One of them was the T-43 minelayer (named 'el Dakhilya') and a number of P-183 torpedo boats. The minelayer could carry 20 KB-class anchored mines and the torpedo boats could carry about 6 KMD-class mines.

During the preparation stage, preliminary patrols were carried out, apparently in order to get to know the area and to practice the operation in the vicinity of the Jubal Islands, an area that is not easy to navigate. It appears that during the period prior to the war, the Egyptian naval vessels carried out at least three exercises/patrols of an operational nature in the southern sector of the Straits of Jubal (in the 'Shadwan Passage' and the 'Tawila Passage'). It certainly appears, and perhaps only in retrospect, that the patrols and activity were dry runs for the minelaying mission (in order to become familiar with the area and as training for the ships' commanders and crew).

Participating in this preliminary activity was a T-43 minelayer and a pair of P-183 torpedo boats accompanied by one or two Komar-class missile boats. As mentioned, at least three exercises/patrols were carried out – the first in April 1973, the second in July 1973 and the last on the night of October 4–5 1973, namely a day and a half prior to the outbreak of fighting!<sup>14</sup>

Another step taken prior to the outbreak of fighting occurred on the evening of the 4<sup>th</sup> of October, when the Egyptians started to reduce the presence of commercial ships operating in their service in the Gulf of Suez. Their activity in the Gulf was permitted only with the approval of naval headquarters starting from sunrise on October 5<sup>th</sup>, 1973.<sup>15</sup>

Apart from the activity to become familiar with the area and the operational dry runs, there was intensive logistic activity in the summer months of 1973 in order to transport sea missiles and sea mines from the navy's warehouses in Alexandria by truck to Safanga (by way of Wadi Kina). Of course, in retrospect, it can be said that this massive transfer was intended to, among other things, ensure that the southern theater would have enough sea mines in order to carry out its minelaying mission.

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14 Bar Yosef, *The Watchman that Fell Asleep*, p. 322.

15 Ibid. In reality, it appears that a number of days after the start of the war the Egyptians successfully evacuated ships in their service from the Gulf of Suez. See footnote 5 above regarding the damage to the Maripela tanker, apparently done by a sea mine while sailing southward through the Straits of Jubal.

## Execution of the minelaying mission

On the first night of the war (between the 6<sup>th</sup> and 7<sup>th</sup> of October 1973), preparations were made in the port of Hurghada by a pair of Komar-class missile boats, a pair of P-183 torpedo boats and a T-43 minelayer, which as mentioned had participated in the action carried out on the night between the 4<sup>th</sup> and 5<sup>th</sup> of October.

It is believed that on that night the missile boats fired a round of sea-to-sea missiles toward 'Ras Mohamed', apparently as a distraction intended to prevent any interference with the activity of the minelayer and the pair of torpedo boats that were laying anchored KA-KRAB-class mines in the Straits of Jubal (laid by the minelayer) and KMD-500 bottom mines (laid by the torpedo boats).

It is worth mentioning that on that night, the Egyptian air force launched 'Kelet' air-to-ground missiles which destroyed a coastal aerial radar station on 'Mount Hatsafra' near the Port of 'Sharm el Sheikh'. It is possible that the bombing was also meant to disrupt and neutralize the radar ability to detect ship traffic from the Port of Hurghada to the Straits of Jubal sector.<sup>16</sup>

In a number of testimonies by senior officers of the Egyptian navy, it is claimed that the mining began a day or two before the war broke out.<sup>17</sup> This seems unusual since laying sea mines with an induction mechanism is irreversible and is evidence of an act of war committed even before the war actually broke out. This issue is not completely clear. Although on the night of October 4–5<sup>th</sup>, there was unusual activity in the vicinity of the Strait of Jubal islands and it is possible that this activity, which occurred very close to the outbreak of the war, was perceived by the force as an operational activity to actually lay mines, rather than just as a practice run. It is also possible that the mining itself was carried out for the first time on the night between October 6–7, 1973.

## Alleged minelaying activity in the Straits of Jubal

Apart from the first day of the war, there were additional actions to complete the sea minefield in the Straits of Jubal on other nights during the course of the war. The commander of the Egyptian navy in his lecture on the war at a symposium held in Cairo in October 1975 mentioned that he managed to carry out the minelaying

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16 This possibility is only presented as a hypothesis and has no support at this stage.

17 Egyptian propaganda file, minute 12:10. <https://www.youtube.com/watch?v=P169--6AXAU> and also the testimony provided in October of 2018 by the commander of an Egyptian torpedo boat, which according to him was involved in the mining operation. For readers of Arabic, following is the link to his testimony. <https://bit.ly/2IOBr9V>

mission without any interference from the Israeli navy, except an incident of the night of the 19-20<sup>th</sup> of October when they were prevented from carrying out a re-mining mission,<sup>18</sup> implying that this was because of the activity of the Israeli navy. It unclears which Israeli activity he is referring to; perhaps the ambush by a pair of Israeli 'Dabur' class boats that was discovered by them near Shadwan Island.



Figure 5: Stills from an Egyptian navy propaganda film on the Yom Kippur War

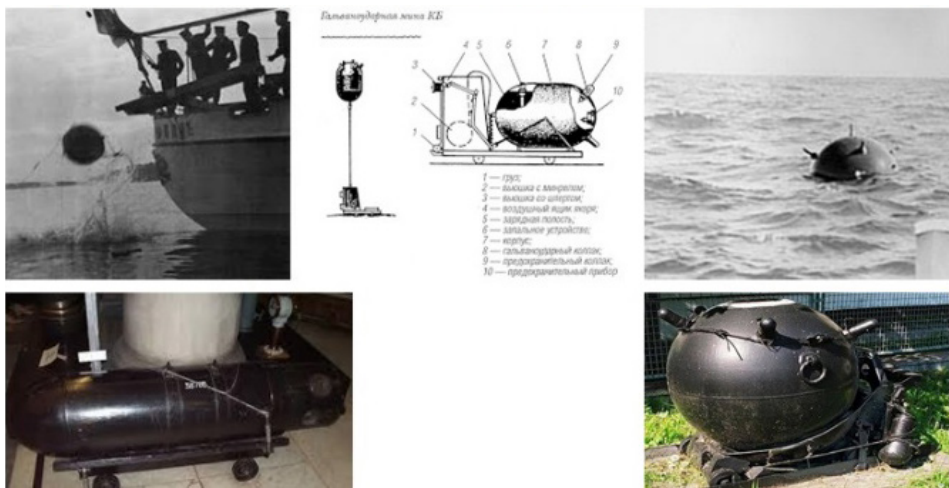


Figure 6: In the center and on the upper left is a KB-series anchored mine; on the lower left is a KMD bottom mine; on the right a M-YAM-type anchored contact mine

According to publications in Russian,<sup>19</sup> whose source is the minesweeping activity carried out by the Soviet naval squadron after the war during the second half of 1974, it appears that in total the Egyptians laid of 72 mines in 5 rows, of which about

18 From a lecture by the Egyptian naval commander. <https://archive.kippur-center.org/arab-sources/lecture-admiral-abu-zikri-1975-new-eng.pdf>. p. 116.

19 Alex Rozin. <http://alerozin.narod.ru/Suez.htm>

40 were AMD-2-500-class seabed mines and about 30 were KRAB-KB-class anchored mines. These are induction mines with an acoustic/magnetic mechanism.



Figure 7: Soviet-made T-43-model minelayer in use by the Egyptian navy (one like "el Dakhiliya" was ready in Hurghada/Safaga)



Figure 8: A P-183 torpedo boat that took part in the minelaying mission

That same Russian publication mentions the interesting fact that part of the minelaying activity was carried out by mobilized fishing boats. This possibility cannot be ruled out; however, it is likely that if there was assistance from mobilized fishing boats, then this was for the purpose of laying a sparser mine field southwest of the el Tor harbor, carried out by Egyptian naval commandos.<sup>20</sup> One way or another, the Russian document expresses blunt criticism of the quality of the Egyptian documentation and mapping of the rows of mines that were laid. According to the Russians, they did not receive any documents, drawings, plans or maps with the minefields marked on them.

### Soviet minesweeping after the war

After the war and the separation-of-forces agreement—that was signed between Israel and Egypt and according to which the IDF was deployed along new lines in the Sinai in March 1974—there arose the urgent need for the Egyptian government to reopen the Suez Canal in order to restore traffic through it, which was so important to the Egyptian economy.

20 To the extent that there was minelaying activity by naval commandos in the el Tor sector, it is likely that these were lighter Soviet- or Polish-made M-YAM-class anchored contact mines

In order to enable the opening of the Canal for secure international shipping, it was necessary to clear the Canal itself of mines, ordinance and various obstacles, as well as clearing the sea mine fields in the southern Gulf of Suez, which were laid during the Yom Kippur War.

Egypt did not have the capability of carrying out this task and therefore it signed agreements with the US, France and Britain for clearing the northern part of the Suez Canal. With respect to the southern Gulf of Suez and particularly the Straits of Jubal, Egypt signed an agreement with the Soviet Union at the end of May 1974, according to which the Soviets would clear this region of the sea mines laid by the Egyptian navy.

In order to carry out this mission, a Soviet naval taskforce was put together that included the 'Leningrad' helicopter carrier, which carried helicopters that had been adapted for mine clearing (Kamov-25 helicopters and a pair of M-8-class helicopters), a destroyer and a tanker, which sailed from the Black sea to the Red Sea in June 1974 by the long way around Africa until arriving at in the area of Hurghada. On the way, they were joined by five minesweepers of the Soviet navy from the Pacific Ocean.

The Soviet taskforce began the mission of mine clearing in August 1974 and it lasted several weeks. Despite specific problems encountered by the Soviet crews with their Egyptian hosts and the Israelis who closely monitored their activity, the mine clearing was accomplished successfully. It included massive helicopter activity which combined mine clearing and exploding of the mines (188 flights which involved 339 flying hours).<sup>21</sup>

It is worth mentioning that during the mission, the Soviets tried to approach the Milan Passage in order to clear it as well, since they claimed that they had been informed by the Egyptians that it had also been mined. Urgent talks were held between Israel's naval command and senior UN officials, in addition to a dialogue on location between the theater's intelligence officer and the Russian commander of one of the minesweepers. The intelligence officer reported to the Russian commander that the Milan Passage is not mined and that the information he was given by the Egyptians is incorrect. Proof of this was the safe flow of traffic through the passage during the preceding months. As a result, the Soviets gave up on the idea of minesweeping in the passage.<sup>22</sup>

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21 Pesach Malovani, *Red Flag over the Middle East*, pp. 322–3. [Hebrew]

22 Personal testimony of T. who was at that time the naval intelligence officer of the theater.

On the conclusion of the mission, at the end of November 1974, the government of the Soviet Union and the government of Egypt thanked the crews for their efforts. The commander of the Soviet naval task force was invited by President Sadat as his personal guest to the opening ceremony of the Suez Canal in June 1975.<sup>23</sup>

### Summary and conclusions

The offensive sea mines laid by Egypt in the southern Gulf of Suez during the Yom Kippur War was a complementary component of the naval blockade of the central and southern Red Sea, with the goal of preventing the flow of oil tankers to the Port of Eilat, both from the Persian Gulf and from the "oil corridor" in the Gulf of Suez. In the planning stage, Egypt made sure that both the maritime blockade and the minelaying operation did not violate international law. In their view, these two components were only aimed against Israeli shipping or shipping headed for Israel.

The Egyptians believed—and on this point they were correct—that the Israeli navy at that time did not have a response to the two threats that were emerging in the Red Sea, namely the maritime blockade and the sea mines.

The laying of sea mines was a complete surprise for the Israeli navy, in contrast to the earlier predictions of Israeli Intelligence regarding the intention to deploy a blockade in the Red Sea. It may be that this option was not taken into account since there was a working assumption that the Gulf of Suez and the Straits of Jubal are also used by the Egyptians for military and civilian vessels traveling to and from the Gulf of Suez.

It is beyond the scope of this chapter to deal with another question that is important in its own right: Were the Israeli navy and naval intelligence capable of predicting this operational option? The answer to this question requires an analysis that goes beyond the current study.

In any case, the fact that the planning and the execution of the Egyptian navy was able to carry out the mission in secret, such that the Israeli navy became aware of the sea minefield in the southern Gulf of Suez **only about two days after the ceasefire went into effect** and only as a result of the sinking of the Siris tanker and two weeks later the damage to the Sirena tanker.

Even though the Egyptians succeeded in achieving surprise and they correctly assessed the inability of the Israeli navy to clear sea mines, in the opinion of the author the Egyptian planning was not without flaws. Thus, Israel came up with an

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<sup>23</sup> Malovani, p. 323.

immediate response to the threat. Although this was not a technological response in the form of mine-clearing ability, Israel quickly found another solution by preparing an alternative internal passage (the Milan Passage) to accommodate relatively large ships such as tankers. The author believes that if the Egyptians had carried out a hydrographic analysis, they would have understood the feasibility of using the Milan Passage. Therefore, although the mining mission was successful, it was not perfect. After the war, when the Egyptians noticed that an internal passage was being used, they tried to mine it as well, but were unsuccessful.<sup>24</sup>

With respect to the purpose of the sea mines, a weapon whose first use by the Egyptian navy was during the Yom Kippur War, its main goal from the standpoint of the senior political and military echelons was, on a strategic level, to disrupt the transport of oil from the Egyptian oil fields in the Gulf of Suez to the oil terminal in Eilat.

Nonetheless, it is possible, as claimed (in retrospect) by the head of naval operations of the Egyptian navy, that on the operational level another (and secondary) goal of the sea mines was to prevent an Israeli landing on the western side of the Gulf of Suez, based on a lesson learned from the success of the Israeli armored raid during the War of Attrition in September 1969. At least from the viewpoint of the then Egyptian commander, this was a logical plan since "once burned, twice shy."<sup>25</sup>

After the war, in an article in English by the head of operations of the Egyptian navy in 1998, he praised the achievements of the Egyptian navy in the October War and mentioned, among other things, the inability of Israel to carry out an amphibious landing on the western side of the Gulf of Suez as a result of—according to him—the sea mines in the southern Gulf of Suez.<sup>26</sup>

In the opinion of the author, the boast that the sea mines prevented Israel from carrying out a landing in the Gulf of Suez during the war is not justified. Although

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24 The attempt to lay mines in the Milan Passage is described by the commander of the torpedo ship that was involved in the mission, which took place after the war and was unsuccessful. The readers of Arabic can find the testimony of Mahmud Ottoman Zyad at the following link in footnote 12. <https://bit.ly/3pQ3zdH>

25 The commander of the Egyptian navy, Fouad Abou Zikry, who in a previous round had also been the commander of the navy until September 1969, was dismissed by Nasser after the Israeli armored raid (Operation Raviv).

26 Ashraf Raafat in a 1998 article. The article was published in English in the Naval Forces magazine, volume 5/98 pp. 76-80. For a discussion of the effectiveness of the mines in preventing an Israeli landing, see page 80 in the following link. <https://archive.kippur-center.org/arab-sources/ar-egyptian-navy-1973-october-war-1998.pdf>



during the war, there was an Israeli plan for a large-scale amphibious landing on the western shore of the southern Gulf of Suez, it was cancelled long before it became clear to Israel that the southern Gulf of Suez had been mined. Thus, the fact that there was no landing was not due to the threat of mines at the southern opening of the Gulf of Suez. There were other reasons for the cancellation that have nothing to do with the threat of the sea mines.

One way or another, there may be room to ask the question of what would have happened if the landing operation had not been cancelled and would have taken place in areas where sea mines had been laid. As historians say, one shouldn't ask what would have happened if.

Ironically, after a little more than a decade, the Egyptians themselves fell victim to offensive mines in the Gulf of Suez. This took place in the summer of 1984 when Libya, apparently at the request of the Iranians, laid seabed mines in the Gulf of Suez by means of a Libyan roll-on/roll-off ship named the Ghat. The mines were a source of concern among the Egyptians due to the fear that traffic through the Suez Canal would be interrupted. At the end of the day, the Gulf of Suez was cleared with the assistance of foreign navies. Paradoxically, the first ship to be damaged by one of the (Soviet-made) mines was a Russian merchant vessel. The mines were laid, as mentioned, at the request of the Iranians because Egypt supported Iraq during the Iran-Iraq war and provided large quantities of arms to the Iraqi army sent from the Port of Suez to the ports of Aqaba and Yanbu.

Finally, the Israeli navy was surprised by the sea mines laid by the Egyptian army in the southern Gulf of Suez during the Yom Kippur War. It did not have the technological means to deal with the threat and an operational solution was found by locating an alternative route, thanks to the existence of an internal passage that the Egyptians had ignored during the planning and execution stage.

The current configuration of threats, whether from the Hezbollah in Lebanon, terrorists in the Gaza Strip, the Houthis in the southern Red Sea at the Bab el Mandeb Strait or from Iran and the Revolutionary Guard's naval force, also includes the threat of offensive sea mines that might be used against Israel in order to disrupt traffic to its ports. It can be hoped that since the Yom Kippur War there has been an improvement in the capabilities of the Israeli navy in clearing and neutralizing areas that are suspected of containing mines.

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## The Options for a Commercial International Port in the Gaza Strip: A Historical Perspective

*Yossi Ashkenazi*<sup>1</sup>

The construction of a port for the Gaza Strip has been under discussion for close to 30 years. It includes complex issues and in particular Israeli security inspections in order to prevent the acquisition of weapons by Hamas as opposed to the economic needs of close to two million residents in Gaza, in addition to the fact the existence of a port that ships from all over the world will visit will be a sign of Palestinian national sovereignty.

The goal of this chapter is to provide a historic and geographic review of the various alternatives that have been put forward for the construction of a port in Gaza and other options that are specifically designed for the Gaza Strip. The chapter is politically neutral, and its goal is to factually describe the options, although it appears that the option eventually chosen will be part of a broader arrangement between Israel and the Palestinians and will not stand alone.

### Introduction

From a historical perspective, the question of building a port in Gaza first arose in 1993 with the signing of the 'Oslo accords'. As part of the accords, the foundations were laid for agreements with the Palestinian Authority (PA) to evaluate the possibility of building a port in Gaza. The issue became even more relevant with the Disengagement from the Gaza Strip in 2005,<sup>2</sup> which was meant to end Israel's relationship with Gaza and its responsibility for Gaza's citizens. Nonetheless, and for understandable security reasons, Israel continued its supervision of trade (primarily imports) between Gaza, Israel, the West bank and other countries.

According to the Paris Accord, which was the economic appendix attached to the Oslo agreements that defines the bilateral economic and commercial relationship, Israel and the PA are considered to be a "single tariff envelope". In other words, processes to do with international trade, such as tariffs, regulation, etc., take place only on the entry of the goods into Israel while the conveyance of the goods between

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1 This chapter is based on a paper written in 2015 as part of my studies at the National Security College.

2 The Israeli disengagement from Gaza was the unilateral dismantling in 2005 of the 21 Israeli settlements in the Gaza Strip and the evacuation of the settlers and Israeli army from inside the Gaza Strip.

Israel and the PA is not defined as international trade. This situation was maintained, at least officially, also after the Disengagement.

Following the Oslo accords, a Dutch- French consortium consisting of the Dutch company Ballast- Nedam and the French company Spie- Batignolles began the planning of a port in the Gaza Strip in the 1990s and later on even began building it. During this process, disagreements arose as to the way in which Israel would inspect the goods and equipment arriving in the port in order to prevent the smuggling of weapons. In September 2000, a short time after work was started, the Second 'Intifada' broke out. After the "lynch" in Ramallah,<sup>3</sup> the IDF bombed the port infrastructure that had been constructed, as well as the airport, and during the ensuing 20 years until today construction has not been resumed.

It is also worth mentioning the work of three academics: Professor Zeev Hirsh, Shauli Katznelson and David Sasson, who wrote a policy paper that included several alternatives for the construction of a port in the Gaza Strip.<sup>4</sup> They sought to demonstrate the advantages of a port in Gaza from the perspective of flexibility and the conveyance of goods to the South of the State of Israel, to the West Bank and even to Jordan, and that the port could serve as a catalyst for the building of roads, railways and other types of infrastructure. The policy paper outlined a 30-year plan that included, among other things, the building of a main road connecting Gaza to Amman. Naturally, and as in the case of any port, their concept would lead to employment solutions for the local population and the creation of job training programs for port-related occupations, such as logistics, freight-forwarding, crane operation, etc. Hirsh felt that the economics of the project would accelerate geopolitical processes and therefore he went beyond the construction of a port by also suggesting the establishment of a free trade zone that together with the port and the accompanying logistic facilities would be a positive factor in the achievement of peace.

After Israel withdrew from Gaza as part of the Disengagement in 2005, the Palestinian Port Authority submitted a proposal to build a port in the Gaza Strip based on the previous plan, namely a port located in the northern part of the Gaza strip. The proposal was submitted by the engineer Kaled Abu Gumiza.

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3 During the "lynch" in Ramallah on October 12<sup>th</sup>, 2000, two IDF reserve soldiers were attacked and killed by a Palestinian mob.

4 Zeev Hirsch, Shauli Katznelson and David Sasson, A Free Economic Zone and Port for the Gaza Region. The Hammer Fund for Economic Cooperation in the Middle East, Tel Aviv University, 1991.

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Following Operation 'Cast Lead' in late 2014, the issue of a port in Gaza again made the headlines as part of a possible agreement with the Palestinians. The agreement by Israel for the construction of a port in Gaza in the reality that followed Operation Cast Lead was interpreted as an unprecedented achievement for Hamas. Avigdor Lieberman, who was Foreign Minister at the time, attacked the Hamas by claiming that the organization is seeking political gain by means of terror.

As we are about to enter 2021, there is still no change in the Israeli position with regard to the construction of a commercial port on the coast of the Gaza Strip. There is a full sea blockade on the Gaza Strip, which means closure of Gaza's coast by the Israeli navy and preventing the arrival of ships to the Gaza Strip. Nonetheless, from 2015 until 2020 Israel gave serious consideration to a number of options that could open the door to international trade to and from the Gaza Strip, while at the same they do not force Israel to put aside any of its conditions for full security and for the prevention of use of any future port by Hamas for an arms buildup.

Accordingly, I will review the various ways to approach the idea of a commercial international port in the Gaza Strip, as they have been presented over the years.

### **First option: The status quo – the Port of Ashdod**

This option is the current situation, as it has existed since the Disengagement from Gaza. The arrival of sea freight to the Gaza Strip currently passes through the Port of Ashdod. About 4 percent of the goods arriving in the Port of Ashdod are destined for Gaza. This involves traffic of equivalent of about 3,000 containers per year (according to data of the Israeli Shipping Bureau for 2014; the quantity of goods arriving by sea for the Gaza Strip has remained virtually unchanged for the past five years<sup>5</sup>).

Most of the goods are unloaded at the Port of Ashdod. They undergo several security and industrial inspections and then make their way overland to the Gaza Strip. It is prohibited by Israel for cargo containers to enter Gaza and therefore the goods arriving at the Port of Ashdod are unloaded and then transferred onto trucks of one configuration or another. The goods pass through two conveyance systems, one Israeli and one Palestinian (within the Gaza Strip) and the interface between them is the Kerem Shalom crossing.

It is worthwhile describing the current reality by way of the "story" of a container's journey from the moment that it is ordered by a Palestinian businessman until it arrives at its destination in Gaza.

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5 Interview with a senior official of the Port of Ashdod in 2020.

***The journey of a container:***

In a meeting at the Gaza Coordination and Liaison center at the 'Erez Crossing', I heard about the "journey" of a Palestinian import container headed for the Gaza Strip from the Port of Ashdod that contained a shipment of fertile eggs.<sup>6</sup>

*The Palestinian businessman travels to Spain and locates a chicken farm in order to import fertilized eggs. He does this after comparing the cost of importing them from Turkey, Italy, the US and Germany and decides to import the eggs (based on their cost) from Spain. The Palestinian businessman is dependent on an import permit from the Veterinary Service in Israel. On the assumption that he obtains the relevant permit, he arranges sea transport from Spain to Ashdod. When it arrives at the Port of Ashdod, it is unloaded into the bonded warehouse. An Israeli veterinarian inspects the shipment's documents, physically checks the eggs unloaded from the container and approves them. Now, the eggs have to be reloaded by means of a forklift onto trucks, which involves a fee paid to the Port of Ashdod for port services. The goods are loaded onto the Israeli truck at a cost of at least NIS 5,000 (this is a specialized truck – it is closed and refrigerated).*

*The truck makes the trip from Ashdod to the 'Kerem Shalom' crossing in about two hours. This is the only crossing for goods into Gaza. Now the goods will wait for between one and four hours. Sometimes the goods may not enter Gaza on the same day. When its turn comes, the goods are unloaded from the truck and eggs go through a security and veterinarian inspection.*

*At this stage, what is called a "sterile" truck arrives to take the goods from Israeli territory into Palestinian territory. The sterile zone is secured by the IDF. After the sterile truck gets to the other side—the Palestinian side—here again there is a wait of between an hour and a full day. On the Palestinian side, the sterile truck is unloaded, and the goods are loaded onto a "regular" Palestinian truck. Since goods can cross only by way of Kerem Shalom, transportation is usually required also in the Gaza Strip to the eggs' final destination. The cost of the crossing is NIS 1,000, the cost of using the sterile truck is NIS 500, and the cost of the Palestinian levy is NIS 50 per ton (in other words a truck carrying 20 tons of eggs will involve a levy of NIS 1,000). Palestinian taxes add about NIS 200 per truck. There is also indirect damage to the goods, including damage to the eggs during the crossing and the loading and unloading, and the theft by the Palestinian workers during the transportation due to their dire economic situation. All of these delays reduce the quality of the eggs and their percentage of hatching is reduced from 90 percent to 75 percent. That 25 percent drop in quality represents eggs that will be disposed of.*

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6 Interview with a senior official at the Gaza Coordination and Liaison center on December 21, 2014.

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The service provided to the Palestinians by the Port of Ashdod has been improved significantly during the past year, thanks to a business policy of "supplier–customer" while maintaining the level of security.

### **Second option: A Palestinian pier in the Port of Ashdod**

During the late 1990s, the Ports and Railway Authority in Israel (as it was then called) offered the Palestinians a "Palestinian pier" in the Port of Ashdod in order to avoid the cost of building a commercial port in the Gaza Strip. The pier would provide all of the symbols of sovereignty that are so important to the PA, such as a mechanism for use of the pier whereby imports and exports would not be considered as goods transported by way of Israel but rather would be considered to be only Palestinian goods. As part of the plan: workers and a pier would be allocated periodically to the PA in order to move cargo; Palestinian inspectors would be included in the activity; and an area of the port would be leased to the PA for the offices of customs brokers, inspectors, etc. including storage area, namely a full Palestinian logistical zone.

In the short run, the Ports and Railway Authority proposed to the PA that the Palestinian pier would be allocated to it on request and in the long run, when the port is expanded, it would be possible to consider the permanent allocation of a pier to the Palestinians. In a policy paper of the Ports and Railway Authority, called "Operation of a Palestinian Pier in the Port of Ashdod", consideration was given for separate incoming and outgoing traffic on the Palestinian pier in the future (Marom and Agamon, 1998). In the end, the plan was shelved due to a lack of interest on the Palestinian side.

The economic assumption of a Palestinian pier in Ashdod is that the goods that are unloaded still need to travel overland to the Gaza Strip. Given that this will be done without any special fees, the economic calculation changes radically. In this option, there is no difference between goods unloaded on the pier and transferred by land to Jordan, to the West Bank or any other land destination, just like goods unloaded in the Port of Haifa that are transported overland to various destinations in the State of Israel, Jordan and the West Bank.

The possibility of a Palestinian pier that handles only exports is not economically feasible since the ship that will leave the pier and will unload the goods in the destination port will not be able to return with freight being imported to the Gaza Strip.

As of 2020, this option is not relevant to any degree in view of the geopolitical situation between Israel and the Gaza Strip.

### Third option: A deep-water or shallow-water port in Gaza

It would appear that most of the public discourse on the issue of a port in Gaza has in mind a deep-water port based on the aforementioned plan by the Dutch- French consortium Ballast Nedam put together in the 1990s.

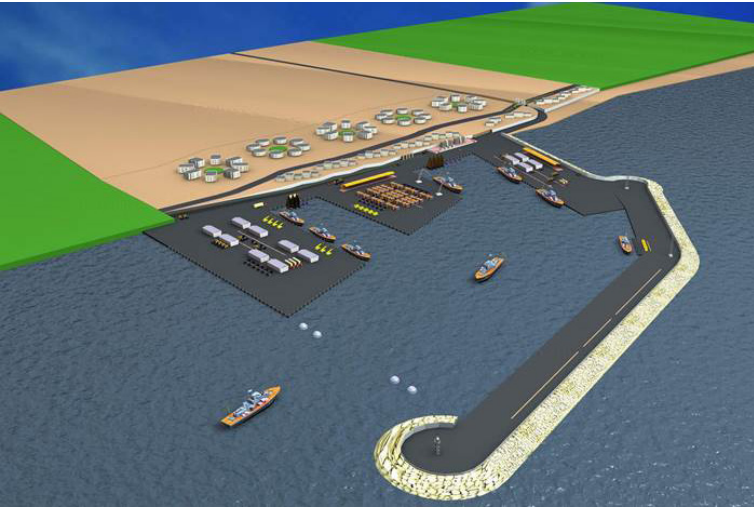


Figure 1: A simulation of the planned port accessed from the site of the Ballast Nedam consortium

Based on the information in the "Strategic Masterplan for the Development of Israel's Mediterranean Ports" of the Israel Ports Company (IPC) from 2006, a clear plan was ready for the creation of a shallow-water port in Gaza that would be used for RORO ships,<sup>7</sup> as a branch of the Egyptian ports of Port Said (the main transshipment port in the Eastern Mediterranean) and the port of Damietta.

The planned port was not meant to handle the loading and unloading of containers, but rather general cargo ships whose freight is intended to be transported from there overland. The IPC's forecast in 2006 related to the provision of services by the port in Gaza and that of 'el- Arish' to meet the needs of the PA, Jordan and Iraq (according to the situation in 2006). Moreover, and according to the forecast, although efficient and active ports in Gaza and el-Arish would not be able to compete with Israel's commercial ports, they would increase, at their expense, the share of Palestinian goods transported by sea. Clearly this forecast was dependent on the political and geopolitical situation, just like any other plan.

<sup>7</sup> Rollon/rolloff. These ships allow for a loaded truck to get on to the ship itself.

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Nonetheless, the large transshipment ports that exist today are deep-water ports that can serve giant ships (of 18,000 TEU and more, which have a draught that requires deep water in the port). In Israel the two new ports being built will provide a solution for these ships (the Ha'mifratz Port in Haifa and the Ha'darom Port in Ashdod), which will reduce the need to use feeder ships from other transshipment ports in the Eastern Mediterranean, will shorten the time of conveyance, will reduce the dependence of Israel on foreign ports and will save sea transportation costs.<sup>8</sup>

Therefore, from the perspective of 2020, and given the technological progress in shipping and ports, a port in Gaza can take one of two possible forms: a shallow-water port designed to handle cargo ships arriving from the main transshipment ports in the Eastern Mediterranean or an independent deep-water port (although this possibility involves a financial investment of a much greater magnitude).

The aforementioned port, whatever its configuration, will serve as a source of employment and will provide jobs for the local population.

This is the case as we enter 2021 and even more so once the two aforementioned ports being built in Haifa and Ashdod (Ha'mifratz and Ha'darom), which are planned to operate semi-automatically and will be operated by leading international terminal operating companies, are completed. Current technology is changing the world order and occupations that were previously common in the ports will no longer exist. A prime example is crane operators – an occupation that is disappearing from the world of the ports, as a result of the remote-control technology that facilitates a central control room and loading/unloading without the mediation of a human being.

Apart from the movement of goods by ship, a port has an important role to play also in the movement of people from one place to another, such as incoming and outgoing tourism. The cruise activity by way of Gaza to both Egypt and Jordan and the West Bank could in principle be a major engine of growth. The port in Gaza could serve as a port for passenger ships for the purpose of tourism or coastal cruises, just like the model that exists in Israel, which includes, for example, local ships operated by 'Mano Cruise Lines' and other local ships liners and international cruise companies. For purposes of illustration, about half a million cruise passengers pass through Israel's ports every year (ignoring of course the period of the Corona crisis).

The measure of tourism in this context is the number of passengers that enter the port for a one-day visit. Here again, the port in Gaza in a different reality could serve

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8 Statistical Yearbook of Shipping and Ports for 2019, Ministry of Transportation, the Shipping and Ports Authority (SPA), p. 8. [http://asp.mot.gov.il/SPA\\_HE/StatisticalYearBook19.pdf](http://asp.mot.gov.il/SPA_HE/StatisticalYearBook19.pdf) [Hebrew]



as a catalyst in the local economy by means of coastal tourism, whether planned or spontaneous.

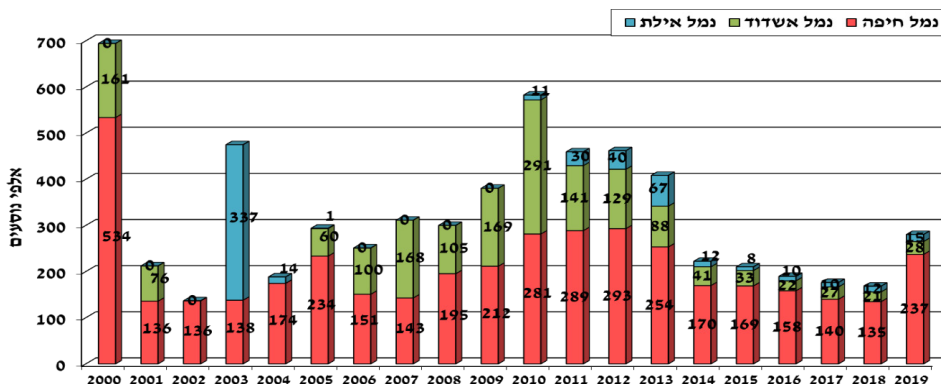


Figure 2: Passenger traffic in Israel's ports 2000–19<sup>9</sup>

#### Fourth option: A seaport or an airport on an artificial island

The construction of artificial islands to house infrastructure has been discussed in more than a few engineering-technological studies, which have also provided examples of its implementation. A review of the various technologies for constructing artificial islands appears in Appendix A to this chapter.<sup>10</sup> Weiss (2014) describes the expected needs of the State of Israel in the realm of infrastructure and in that context surveys the building of artificial islands off the coast of Israel.<sup>11</sup> Borat (2014) also examines the subject of artificial islands off the coast of Israel,<sup>12</sup> as does a paper by researchers at the Technion.<sup>13</sup>

9 Ibid., pp. 38–39.

10 The technologies for artificial islands have also been reviewed in Moti Klamer, *Artificial Islands for Energy Infrastructure*, Maritime Strategic Evaluation for Israel 2016/17, p. 166 and Moti Klamer and Ehud Gonen, *Developments in the Construction of Artificial Islands and Floating Platforms during the Past Year*, Maritime Strategic Evaluation for Israel 2018/19, p. 206.

11 Shmuel Weiss, 2014. *Artificial Islands: A Milestone in the Development of the State of Israel?* Chaikin Chair for Geostrategy at Haifa University and the National Security Council Research Center. <https://bit.ly/3eaiD1i> [Hebrew].

12 Michael Borat, *The Maritime option – the Blue Avenue*, Chaikin Chair for Geostrategy, Haifa University, 2014. <https://ch-strategy.hevra.haifa.ac.il/index.php/studies-and-publications/books/45-20140201> [Hebrew].

13 *Maritime Plan for Israel, Stage III Artificial Islands as a Policy tool*, 2015. <https://bit.ly/2JOnkBr> [Hebrew].

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The plan for an artificial island that will be used for a seaport and an airport for Gaza was proposed by Minister of Transportation Israel Katz during Operation 'Protective Edge' (2014). According to the PTP magazine (2014), Katz claimed that this project will help Israel free itself of civil responsibility for the Gaza Strip and will facilitate civilian separation, whereby Israel will no longer supply electricity, fuel and food to Gaza. At the same time, Gaza will undergo a process of disarmament that will include the weapons, rockets and missiles possessed by Hamas. In order to provide for the needs of the Gaza Strip after the cessation of Israeli logistic support, the 'Rafiah' crossing between Gaza and Egypt will be opened for an interim period for the supervised passage of goods and people.

The financing of an artificial island, which according to the plan will be built at a distance of 4.5 km from the Gaza coast, will be provided by the international community, while the engineering model will be provided by the Israel Ports Company. On the island there will be a seaport with a water depth of 30 meters (!), a logistic zone and a marina for yachts. In addition, it will have infrastructure facilities, such as energy plants and a desalination plant, and at a later stage an airport.

The security inspection of goods unloaded on the island will be carried out using Israeli technological means, and on the bridge between it and the Gaza Strip there will be an inspection station to prevent smuggling. This bridge will have the ability to support vehicle traffic, railway lines and pipelines for oil, fuel and natural gas.<sup>14</sup>

The island as a whole will be under international supervision (such as that of NATO) while at sea Israeli control will be maintained and essentially so will the maritime blockade in order to prevent smuggling other than by way of the port.

According to the plan, there will not be any residential building on the island although there will be tourist hotels. The full operation of all the facilities on the island, including the seaport and the airport, will be the responsibility of the Palestinians. The main condition for the implementation of the plan is, as already mentioned, the full demilitarization of Gaza.

Zvi Ben Gelyahu (2011) reports that Katz' plan was presented already in 2011 and received a "green light" to start planning from the Prime Minister, as reported by Channel 2 on March 29<sup>th</sup>, 2011 by Udi Segal. According to the report, the island will have an area of about 8,000 dunam, and the bridge between it and the Gaza Strip will be on pillars, like the bridge at the power stations in the cities of Hadera

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14 "Israel may build artificial island off Gaza Strip coast", Conal Urquhart, The Guardian, 30 March 2011.

and Ashkelon. The plan was put together over a period of three months by a group of experts on shipping and airport traffic, which was appointed by the Minister of Transportation. The cost of the project ranges from 5 to 10 billion dollars and it will require an estimated six to ten years to build. Channel 2 reported at that time that the program had the support of Meir Dagan, former head of Israeli Intelligence, and that it had already been presented to the Israeli Security Cabinet.



Figure 3: Simulation of the proposed artificial island off the coast of Gaza<sup>15</sup>

The spokesperson for the Ministry of Transportation declared that the main goal of the island is to improve the quality of life for Gaza residents without harming Israel's security.<sup>16</sup>

However, today, and in view of the technological advances in the maritime realm (and in particular the Ocean Brick System – OBS), it is possible to make the planning more flexible and even more so the implementation, and of course the price is not of the same magnitude as that of building an island based on breakwaters and fill of sand and rocks brought to the site.

A possible example based on the aforementioned technology is presented below. It can keep the shore free from port facilities, it is more efficient from the viewpoint of time to build, it does not harm the environment and it is certainly feasible from an engineering standpoint.

<sup>15</sup> Spokesperson of the Ministry of Transportation on the site port2port, May 24, 2018.

<sup>16</sup> Ibid (12).



Figure 4: A model of an artificial island that was presented for a port in Georgia to be built using the OBS technology

### Fifth option: A floating port

Already at the beginning of the 1990s, alternatives were considered for a floating deep-water port for Gaza. Livne (1997) describes the methods that were relevant during the second half of the 20<sup>th</sup> century, namely the "flexiport" which was a floating modular port, an application borrowed from the method of building pontoons for drilling islands in the North Sea. The method was adopted by a Dutch company which began building modular "pontoons", namely floating elements that can be assembled in order to create large platforms. The first floating port using the flexiport method was created in the Falklands in 1984, during the war between Argentina and Britain and within less than six months.

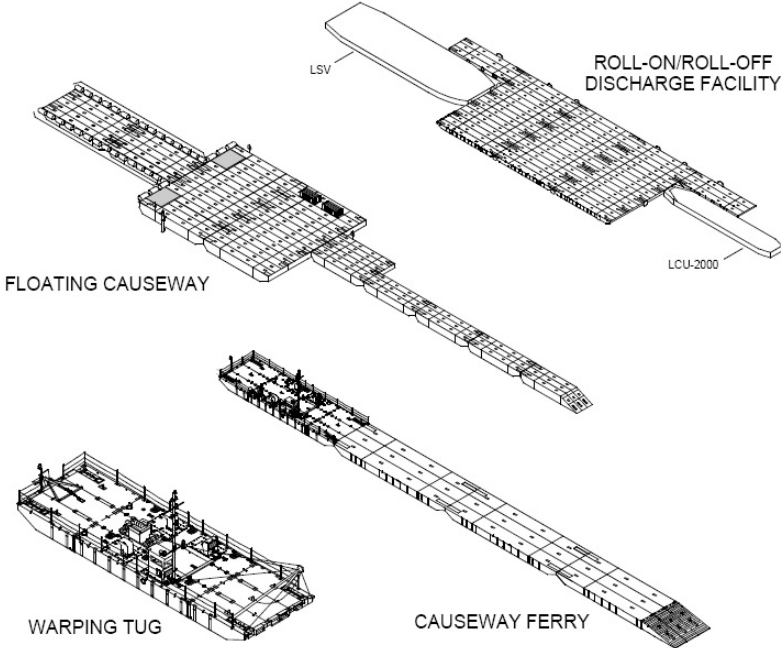
Today, engineering technology makes it possible to build floating ports that have no less capability than traditional deep-water ports on the coast. Stefan Wamfeler (2014) claims that there is currently a trend in the planning of ports toward floating ports that are between twenty and forty miles off the coast and to locate port activity there. The main motivation is security, namely, to be able to check containers arriving in the US before they come onto the mainland.

In this analysis, and when a floating port for Gaza is not the subject of discussion, the intention is to a floating pier of the type used by navies (such as the US navy) in order to enable the anchoring of small to midsize ships for unloading. The US

navy technical manual TM 55-1945-205-10-4 presents the possibilities for building a floating causeway by means of modular components:



Figure 5: Simulation of a floating port<sup>17</sup>



17 <http://www.seasteading.org>.

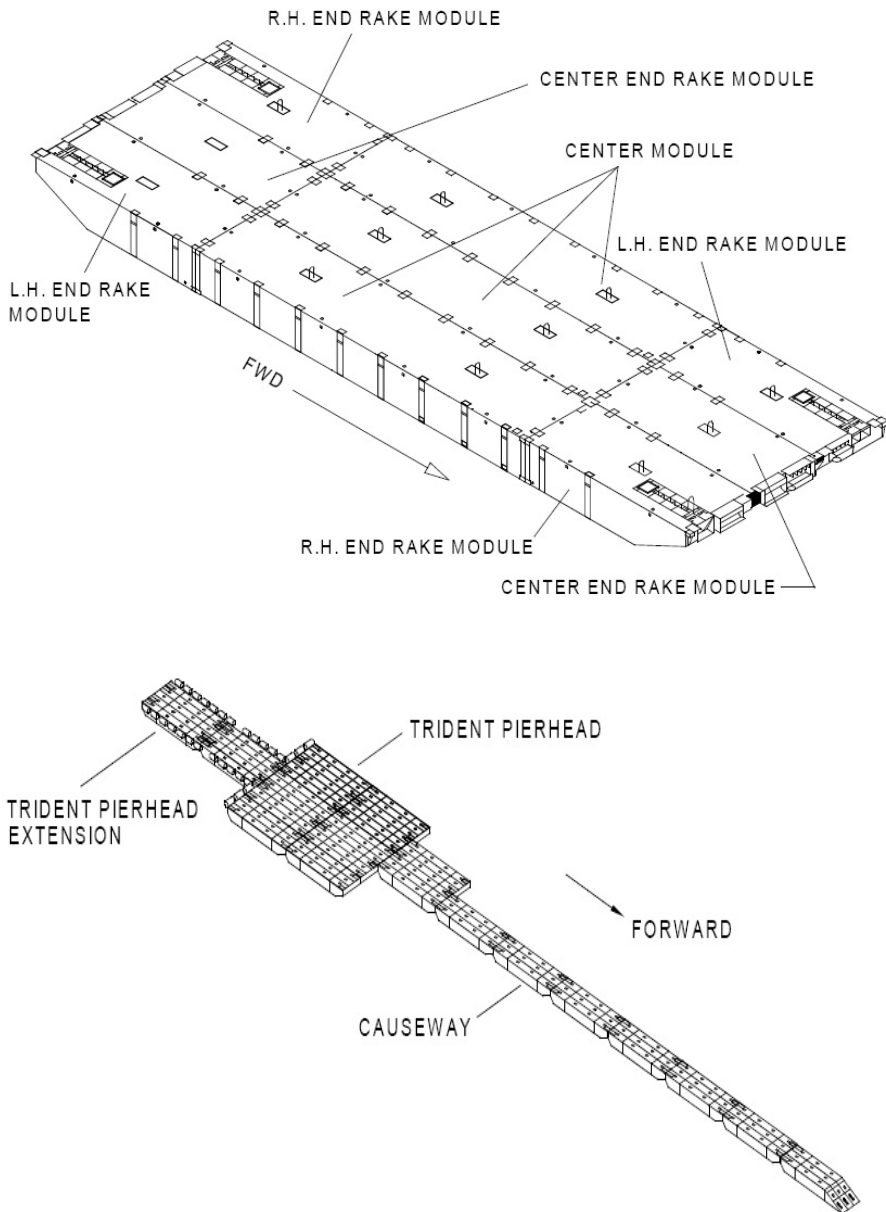


Figure 6: US navy technical manual TM 55-1945-205-10-4 which presents possibilities for the building of a floating causeway by means of the assembly of components<sup>18</sup>

18 The drawings are taken from the American technical manual TM 55-1945-205-10-4 MODULAR CAUSEWAY SYSTEM (MCS) FLOATING CAUSEWAY (FC).  
<https://www.liberatedmanuals.com/TM-55-1945-205-10-4-HR.pdf>

The idea behind this option is to handle feeder ships carrying a relatively small number of containers (between 300 and 2,000) that have been transhipped at another port.



Figure 7: A floating pier

### **Sixth option: A secure transshipment port and a shipping route from it to the Gaza Strip**

This option involves a Palestinian pier at a port in a different country in the Mediterranean basin, to which ships will bring goods that are destined for Gaza. The goods will undergo transshipment and from there will be brought by a designated shipping route to Gaza. The shipping will be done by feeder ships which will arrive at the Gaza Strip and will be handled there on a designated floating port of one type or another (or deeper piers), which will only be used for that purpose.

The countries that have been mentioned in the documentation of this option by the various planners are Cyprus and Turkey. In other words, this involves a Palestinian pier at Larnaca or Limassol (in Cyprus) or Mersin (in Turkey) where security inspections would be carried out (by a third party, such as the EU or NATO).

In early 2013, the Gaza businessman Gawdaat Alhudri submitted an initiative to the District Coordination and Liaison (DCL) of the IDF to establish a shipping line between a Gaza port and a port in Turkey. The initiator of the idea is Alhudri's brother, Gamal,

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a member of the Palestinian parliament who is identified with Islamic organizations and is the Chairman of the "Remove the Blockade" Committee. The initiative includes the removal of the "maritime blockade" on the Gaza Strip as part of the establishment of a supervised sea route between a Gazan port and a single port in Turkey.

A detailed plan submitted by Gawdaat Alhudri to the DCL describes the main motivation for the plan: "Egypt is not providing an appropriate solution to the Gaza Strip's commercial needs."

According to the proposal, the supervised route will connect a Gazan port—that is, a fishing port—to the Port of Mersin in Turkey, and it will be used for ship traffic to and from Mersin. It will not be used by ships coming from other ports. In view of the fact that this is only a fishing boat port, only ships of up to 5,000 tons (according to the proposal) will be able to use this route.

The fishing port in Gaza will be expended to include storage facilities and the necessary infrastructure for the loading and unloading of ships. In addition, it will be possible to upgrade the capabilities of the port in Gaza on the basis of offshore facilities (such as a floating causeway). From the Hamas' standpoint, involving Turkey in this solution is a clear advantage. According to the initiative, the very fact of Turkey's membership in NATO will, at least in theory, reduce Israel's security concerns. As part of this plan, Israel will be part of the security inspection of goods, it will prevent the smuggling of weapons and it will escort ships on the trade route to Gaza. Furthermore, the project will help rehabilitate the diplomatic relations between Turkey and Israel, which deteriorated following the incident of the 'Marmara flotilla', and the two countries will be able to cooperate on the Palestinian issue. Finally, increasing imports from Turkey and the opening of the shipping route between Turkey and Gaza will lead to significantly cheaper imports.

According to Alhudri, the creation of the shipping route has clear advantages, such as the creation of a cheap supply of goods and inputs in the Gaza Strip; a reduction in the cost of transporting goods by way of the tunnels (...); a reduction in the various fees and taxes that are paid to Israel, the PA, Egypt and Hamas; reducing the time needed to import goods relative to the "indirect" routes used today; and the direct collection of tariffs by the PA on goods heading to the Gaza Strip at the port in Turkey. Moreover, there is a potential for using the Gazan port for the import of goods also to the West Bank. The plan will advance the "state" process by way of the channel of "economic independence" for Gaza, will create a direct link between Gaza and foreign markets, will create jobs and will facilitate the movement of people.



However, as of late 2020, Turkey is not a potential player in such an equation from Israel's point of view. But this is not the case for the option of a Palestinian pier within a port in Cyprus. This is a feasible option that should be considered and the Port of Lanarca, for example, is a possible facility for transshipment.

Furthermore, in 2017–18 the IDF again considered the option of a transshipment port but nothing developed in view of the geopolitical reality.

One way or another, if this option is realized, then the Israeli navy will have an additional mission, namely the escort of ships making their way from the transshipment port to the Gaza Strip. The objective will be to ensure that the ships do not link up with other ships on the way in order to receive weapons destined for the Gaza Strip, a mission that will require the investment of resources.

### **Seventh option: The Port of el-Arish – from vision to solution**

In view of the strategic masterplan for the development of Israel's Mediterranean ports, the Egyptians have over the years developed the Port of el-Arish as only a secondary port, with a capacity of only 2 million tons of general cargo, alongside various fishing activities. Nonetheless, in that Israeli plan it is mentioned that the Port of el-Arish can in the future (the plan was written in 2006 with a forecast up to 2050) serve as a key port that will handle part of the maritime transport of goods traveling to and from the Gaza Strip, the West Bank and Jordan (general cargo ships) and thus, together with Israel's ports, will facilitate their imports and exports.

The Port of el-Arish is the most northern Mediterranean port in northern Sinai. Up until 1982, it was indeed defined only as a fishing port. The Egyptian development activity in the port was evident already in 1987 (IPC, Masterplan, 2006) and included the expansion of the breakwater in order to later prepare the port for the handling of cargo ships.

Implicit in the option of expanding el-Arish is, from my perspective, a vision for the full solution of problem of access to an international port for the Gaza Strip and in my estimation, it is possible under certain circumstances.

The el-Arish option is being promoted by a group of businessmen led by Shlomi Fogel<sup>19</sup> and includes an economic solution for the situation in the Gaza Strip.

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<sup>19</sup> Interview, March 20, 2015

***The plan for the development of the Gaza Strip has the following components:***

First, the building of 14 half-islands ("islets") – They will be financed by the Saudis at a cost of \$10 billion. A Belgian company has already performed a feasibility study. The islands will have a total area of 6,000 dunam with a potential of housing about 1 million people and they will expand the territory of the Gaza Strip which is currently 354 sq km.

The second component is the creation of "bubbles" for industrial parks that will serve as free-trade zones. The bubbles will be built by the following countries: Qatar, Dubai and Abu Dhabi, and will be the location of factories built by Israeli, Egyptian and Palestinian entrepreneurs. This will create a win-win convergence of interests.

Moreover, the Americans will finance the project to transform el-Arish into a deep-water port and shipping hub, including an international airport. It will also include a tourist boardwalk in the area of the Bardawil Lake (another Egyptian interest).

The international airport will stimulate the development of the Sinai region and thus will reinforce Egyptian sovereign governance in the peninsula and will help halt the trend toward it becoming a no man's land and an incubator for terror.

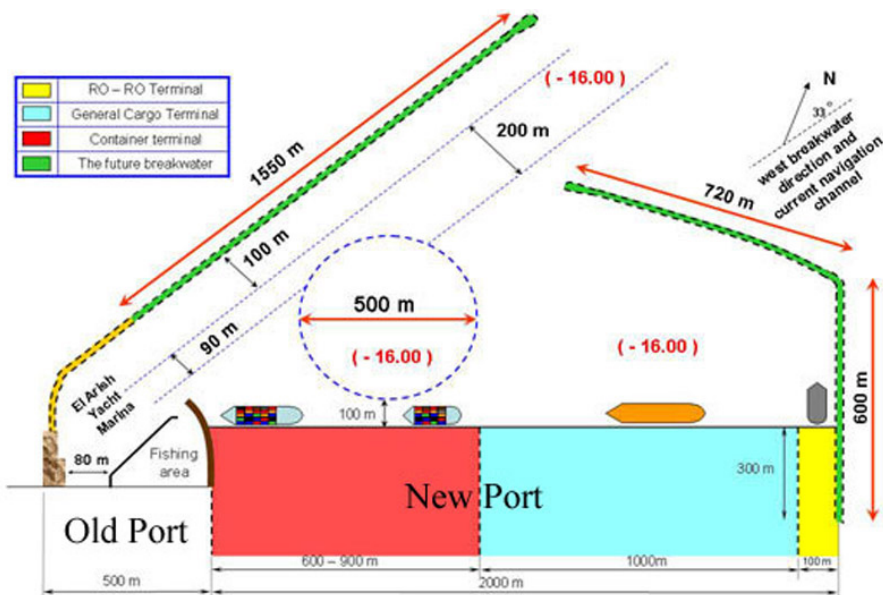


Figure 8: The Port of el-Arish – existing and planned<sup>20</sup>

Essentially, the plan is reminiscent of Zeev Hirsh's aforementioned plan from the early 1990s, which included a free-trade zone on the seam between Israel and the Gaza Strip and described a situation in which the economic prosperity would have benefits on the geopolitical level, even to the point of changing the reality. The new plan is strongly in the interest of all the sides. As of mid-2019, the Port of el-Arish was as pictured in Figure 9.



Figure 9: Aerial photo of the Port of el-Arish<sup>21</sup>

Greater Egyptian control of northern Sinai is still the objective of the Egyptian government in order to preserve its sovereignty in the region.

Both the development of a deep-water port and an airport in el-Arish will, among other things, facilitate the conveyance of goods to and from the Gaza Strip, as will the construction of a power plant, desalination facilities, railways, and other infrastructures.<sup>22</sup>

21 From Google Earth, on the site of the Egyptian government. <http://www.emdb.gov.eg>

22 The Jerusalem Center for Public Affairs, Developing Northern Sinai – A New Diplomatic Paradigm, June 26, 2019. <https://jcpa.org/article/developing-northern-sinai-a-new-diplomatic-paradigm/>

## Conclusion

This chapter has examined the various alternatives for establishing an international trade connection to and from the Gaza Strip. Following is a summary of the alternatives:

Option	Port on the shore of the Gaza Strip	A port off the shore of the Gaza Strip	A port / designated pier in another country in the Eastern Mediterranean	A port in a neighboring country
Construction of infrastructure	Full construction of infrastructure on the coast of Gaza.	Construction of infrastructure using advanced technology.	Will require the building of a facility to handle ships in Gaza or on the shore (expansion of existing fishing port) or a floating facility).	Overland transportation to the Gaza Strip.
Security inspection	Problematic.  Inspection by an international body.	A bridge will facilitate tighter inspection; inspection by means of an international body.	Inspection at the foreign port by an international body.  Securing of the shipping route between the port and Gaza by the Israeli navy.	Egypt: inspection at the Egypt-Gaza border crossing.  Ashdod: Continuation of tight Israeli inspection.
1.	Deep-water port for handling ships of all types.	Port on an artificial island that is connected by a bridge to the shore.	A Palestinian pier in Cyprus (Limassol or Larnaca).	Use of the expanded el-Arish port for the needs of the Gaza Strip.
2.	Shallow-water port for handling feeder ships and RORO ships.	Floating port	Palestinian pier in Turkey (Marsin).	Continued use of the Port of Ashdod for the Gaza Strip.

From a purely economic perspective and in the geographic reality that the ports of Ashdod and el-Arish are only a few dozen kilometers from the border of the Gaza Strip (from the north and from the south, respectively), there is no justification for building another port in Gaza. Therefore, from a purely logistical perspective, the Gaza Strip can be serviced by existing ports and the huge budgets that would be required to build a port in Gaza can be used for other desperately needed infrastructures in the Gaza Strip. Nonetheless, there is also a clear and fundamental Gazan desire for an independent port, both as a symbol of sovereignty and to avoid, at least to some extent (and to an even greater extent in the future), Israel's security inspections of Gazan trade.

In this context, it is worth mentioning that there are many examples of "pairs of ports" that are close to each other but are located in different countries (Eilat and Aqaba are examples from our own region).

The examination of the alternatives for a commercial port in the Gaza Strip or direct Gazan access to international trade needs to take into account Israel's need (which is apparently a clear and absolute Israeli red line) for reliable security inspection of goods transshipped at the port, in order to prevent the smuggling of weapons into the Gaza Strip.

Direct Israeli inspection is apparently not a realistic prospect in an arrangement in which the Palestinians use a port in a third country (rather than in Gaza or in Israel). In such a case, the security inspection will be dependent on the host country (the possibilities surveyed here were Cyprus, Turkey and Egypt), on a reliable international body acceptable to both sides, such as NATO or EU forces, and the use of security technologies that allow for remote Israeli inspection without a physical presence.

Weighed against the Israeli security interest is the Palestinian interest to build a port, as a gateway to international trade and the economic development it would bring and as a symbol of sovereignty.

It is clear that the Gaza Strip desperately needs economic development. However, it is in Israel's interest to consider whether such development will help Hamas preserve its regime in Gaza or whether economic growth will strengthen the Palestinian middle class, which will in the long run oppose the Hamas regime. On the other hand, it is possible—at least in theory and subject to the political developments in the region—to construct a mechanism such that the development of a port will occur simultaneously with the return of the PA to power in Gaza and with the demilitarization of the Gaza Strip, and a certain degree of international involvement.

On a more realistic note, it appears that as long as there is a strong Hamas regime in Gaza, no change in the current situation can be expected.

## **Appendix 1: Examples and technologies for building artificial islands**

There are a few examples worldwide of artificial islands:

The island of Jorong in Singapore whose construction was completed in 2009. It is used for heavy industry as a solution for the shortage of land in Singapore.

The Japanese port of Kube which was built on a total area of 8,000 dunam and which can handle container ships and includes a logistic support area.

The artificial island in Dubai which is used for commercial infrastructure and residence.

The Island of Bilboa in Newport Beach, California which is composed of three artificial islands – Bilboa, Little Bilboa and Collins.

Pearl – Qatar: This is a manmade island with an area of nearly 4 million square meters. This was the first area in Qatar that was made available for ownership by foreign residents, with the population of the island growing from 3,000 in 2011 to 12 thousand in 2015. The island, which is developed by the United Development Company, is expected to also include entertainment facilities for residents, as well as for tourists.

The Palm Islands in Dubai: Three artificial islands off the coast of Dubai in the UAE. The archipelago was built by a land upgrade carried out by the Nail government real estate company. The Palm Islands are called that because they are in the shape of a palm tree. It is the name of the original island and the smallest of the three.

Until recently, the most commonly used technology for creating artificial islands was to bring in sand and boulders from quarries. This method harmed the environment and over time the tolerance for such activity has declined.

The basic building block of an artificial island is the caisson, a prefabricated element made of reinforced concrete that is sunk to the seabed. By accumulated a large number of caissons, it is possible to build breakwaters, islands and more. The caisson can also be hollow and filled with condensed air, and in this way, it can be towed to where it will be placed.

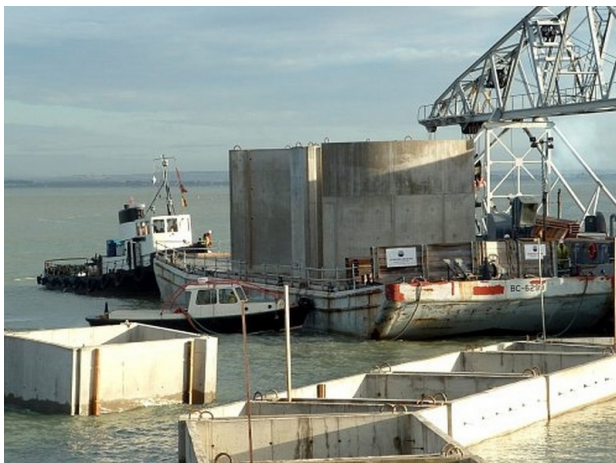
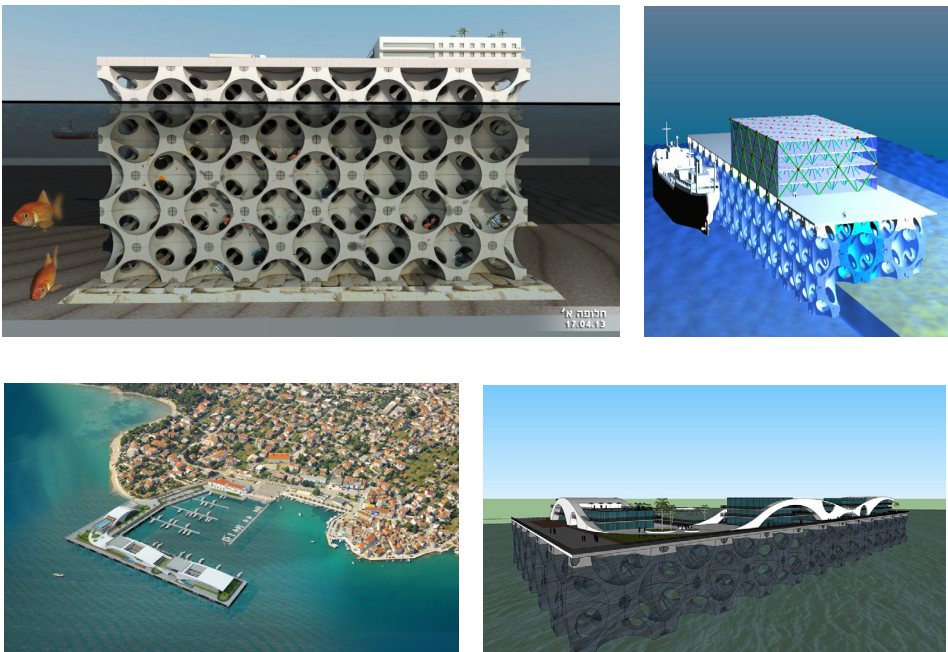


Figure 10: Transporting caissons on a barge

In recent years, there has been a major breakthrough in this domain in the form of Ocean Brick System (OBS) technology, which makes it possible to cast the concrete into special molds and to create elements that can be connected together. The elements are hollow and the construction of a pier, a wharf, a breakwater or an island is possible near the site by casting the elements at the location. There is no need to transport sand or boulders nor to transport the elements from the casting factory to the site. Everything is done on site and without harming the environment. The elements are hollow and therefore, after construction the structure can be towed to the site and sunk in a controlled manner.

Following are a number of examples:



Figures 11–14: An artificial island makes intensive use of raw material. Weiss (2014) estimated that about 70 million cubic meters of raw material is needed for an island of 2,000 dunam and another 10 million cubic meters of quarry material is needed for the breakwaters to protect it. In general, artificial islands that are built in water that is more than 20 meters deep become very expensive projects and therefore the aforementioned innovative method provides a solution at a fraction of the cost of a classic project involving sand and boulders.

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## The Unmanned Helicopter on the Israeli 'Saar' Corvettes – Innovation that was Ahead of its Time

*Itsik Bilia*

### Introduction

In the 1980s, the need arose for the Israeli navy to upgrade the detection and control systems on its corvettes. This followed the installation of American sea-to-sea 'Harpoon' missiles whose range was much longer than that of the corvettes' integrated detection systems. This ability was achieved by the introduction of aerial fixed-wing systems. In this context, an appraisal was also carried out of developing vertical takeoff platforms, such as unmanned helicopters. The project that was considered was called 'MITNOSES' and was based on the American DASH (Drone Anti-Submarine Helicopter). The DASH was developed in the 1950s for anti-submarine warfare and was used by the US in the 1960s during the Vietnam War and elsewhere. The idea was innovative in several ways: the operation of unmanned vehicles that take off and land from a Saar corvette; its technological characteristics, such as a double rotor; and the exploitation of a helicopter's unique traits as part of naval warfare tactics. In the end, the Israeli project was cancelled in the early 1990s. Both then and now, the Navy has neglected the idea of unmanned helicopters on its vessels in favor of manned helicopters.

### The need for a helicopter in the Israeli navy

One of the main lessons learned by the Israeli navy from the Yom Kippur War (1973) was the difficulty in coordinating with the Air Force during wartime, which is dense with events and missions. The navy formulated its tactics as a response to the gap between the range of the Israeli 'Gabriel' missile and its rival in the navies of Egypt and Syria – the Soviet 'Styx' missile. The 'Styx' had a range of 45 km as opposed to 20 km for the 'Gabriel'. The Navy's tactics included various means that would allow the Israeli ships to close the gap to an enemy vessel without being threatened, until it was possible to launch the 'Gabriel'. This included various types of electronic warfare and the role of the Air Force to deter and delay enemy ships from launching missiles in the initial stage. This tactic, developed by Israeli Rear Admiral Hadar Kimhi, in the end led to the desired outcome with respect to being able to cause harm to enemy ships without the Navy's ships being threatened. However, despite the numerous training exercises, during actual warfare the Air Force's planes did not take part in the sea battles—except on one occasion—since they were overburdened with other



missions. The lesson learned was that the Israeli navy is in need of tactical aerial means that are designed specifically for its own unique missions.

Another development that influenced the aerial component of sea warfare was the arrival of the American 'Harpoon' (KANARIT) missile in Israel at the end of the 1970s. It had a range of more than 90 km, which was beyond the range of the radar on the Navy's ships. There thus arose a need for aerial detection systems that could identify targets over the horizon and guide weapons toward them. In addition, this system should not give away the location of the mother ship and therefore an aerial vehicle was ideal since it could be operated far from the ship that launched it.

The combination of the need for air support in order to detect targets over the horizon and the fact that naval missions are not the Air Force's first priority led to the conclusion that the Navy should develop an ability to operate a vertical takeoff vehicle. This vehicle would be tailor-made to the dimensions of the Navy's ships and would provide the ship's commander with independent control over its aerial abilities.

### **A historical survey of helicopters in the Israeli navy**

The first test to land a helicopter on a 'TARSHISG' 'Saar 4' ship was carried out successfully in 1997, using a special structure built into the ship's stern. After that, two 'HOHIT' model 'Saar 4' ships were built which were approximately 4 meters longer than originally planned and they were built with a designated landing platform in the stern and a hangar for storing the helicopter. Obviously this was at the expense of weapon systems that had to be removed from the ship, such as the 76 mm cannon in the stern. Various helicopters participated in the initial missions, including the 'SAIFAN' (Bell 206), 'ANAFAN' (Bell 212) and 'LAHATUT' (Hughes 500 MD Defender). In August 1984, the idea of using helicopters was put into practice during the 'NEKUDAT ZINUK' (starting point) operation in which two of the Navy's HOHIT model ships took part. Each of them had a pair of LAHATUT helicopters armed with antitank missiles. They sailed toward the Lebanese-Syrian border at a distance of about 180 km from Israel. Due to the close proximity to the Syrian border, the Air Force decided not to attack with fighter planes. The small helicopters attacked terrorist targets with great success and returned to the mother ships and to their bases without harm.

In 1985, the Navy received its first naval helicopter, a French-made Dolphin (Eurocopter HH-65). The two helicopters that were acquired suffered from numerous breakdowns and in 1996 a training accident occurred at sea in which one of them

crashed during a night exercise and its crew of three were killed.<sup>1</sup> In 1997, a number of Panther AS-565 (A'TALEF) helicopters were acquired from Airbus Helicopters. These helicopters are in use until today by the Navy. The naval helicopters are operated by the Megenei HaMaarav squadron from the Ramat David base and are under the command of the Navy, in coordination with the Air Force. The Navy decided to acquire eight Seahawk SH-60F helicopters made by the Sikorsky company at a cost of \$300 million. These are second-hand helicopters that were part of the US Navy's surplus and which underwent renovation. A major delay in this deal has been reported and apparently the helicopters will not be supplied in 2020 but only at the end of 2021. It appears that the condition of these helicopters is worse than was expected and the price of their renovation is millions of dollars more than the original forecast.<sup>2</sup>

### The birth of the MITNOSES project

At the beginning of the 1980s, the possibility was raised of using unmanned helicopters. The operational requirements for an unmanned helicopter include the following: vertical takeoff and landing ability of a small vehicle deployed on the ships used by the Navy during that period; ability to carry a significant load, including various types of detection equipment, such as maritime radar and sensors; and an ability to remain in the air for several hours in order to provide the mother ship with a prolonged solution.

In those years, the military industries in Israel had about 15 years of experience in the development of unmanned aerial vehicles; however, that experience was in fixed-wing vehicles. Israel did not possess knowhow in helicopter development and therefore the possibility of developing an Israeli unmanned helicopter was not particularly feasible. Also in the global aviation world, there was a noticeable technological lag of several decades between the development of unmanned helicopters relative to unmanned aerial (fixed-wing) vehicles. It was therefore decided to initiate a project involving a number of partners. The Navy was the customer and it defined the operational requirements, and the Air Force was naturally a partner in the process. Israel Aircraft Industry (IAI) was chosen as the

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1 Lieutenant Colonel Ben Tzion (Bentsi) Becher who was the captain of the helicopter and commander of the squadron, Captain Shahak Sela who was the copilot and Captain Eran Garbiyah, the Navy's Helicopter Patrol Officer. The body of Captain Shahak was found in the searches carried out already that night. Four months later, in January 1997, the body of Lieutenant Colonel Becher was found. The body of Captain Garbiyah was never found (Wikipedia).

2 Udi Etzion (July 5, 2020), The helicopters from the US will be delayed; there will be a cost overrun in the millions, *Calcalist*. [Hebrew]

supplier who would actually do the development and the Ministry of Defense, by means of MAPAT (abbreviation in Hebrew for the Authority for the Development of Weapons and Technological Infrastructure), which would provide support for the project.<sup>3</sup> The IAI established a development group of about 30 engineers led by Shmuel Arbel, the Director of Development. The project was supported by MAPAT, and liaison officers were assigned to it from the Air Force and in particular from the Navy, since the developers were unfamiliar with the naval theater and its unique characteristics.

As part of the feasibility study, various options were examined – kits to self-assemble miniature helicopters; a search for a small manned helicopter that can land on the Navy's small ships with the goal of converting it into an unmanned helicopter; and the consideration of, among others, the Schweizer model 330 helicopter made in Switzerland. At that time, there were unmanned helicopter solutions offered by Schiebel, an Austrian company but these were small and did not have the ability to carry a large load and remain in the air for an extended period of time, as required by the Navy. The manned helicopters that were in the service of the Air force at the time (SAIFAN, ANAFA, and LAHATUT) did not have the ability to remain aloft for the time required by the Navy either. MAPAT and the Navy also carried out a search for a helicopter with a long-distance remote navigation and control system and found a potential candidate in the American DASH which was in use in the 1960s. After carrying out a number of investigations, the option based on the American unmanned helicopter manufactured by Gyrodyne was chosen. This vehicle was in active service with the US Navy during the 1960s and in the Vietnam War. It had a double coaxial rotor system, which eliminates the need for a tail rotor, thus saving valuable space. An agreement for sharing of knowledge was signed and it included an American export license. Peter Papadacos, the owner of Gyrodyne, worked closely with his Israeli counterparts, and provided the drawings and documents needed to produce the systems in Israel. The mechanical system had the following specifications, which met the Navy's operational requirements: maximal liftoff weight of 1,100 kilograms, of which cargo and fuel would be 600 kg; maximal speed of 100 knots; and time in the air of about six hours.

At the end, three units were purchased – two were used as prototypes and a third for spare parts. They were delivered to RAMTA in Jerusalem, IAI's helicopter maintenance facility. This process made use of the innovation of a different navy;

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3 MAPAT is responsible for research into innovative capabilities and also supports the development of projects initiated by the various corps that involve development and acquisition. The support is in the form of both budgets and professional consultation.

essentially, the Israeli navy had acquired an unmanned helicopter that was in use in the US Navy<sup>4</sup> and continued to develop it and modify it to its own needs.

### The Gyrodyne QH-50 DASH

The American destroyers in World War II were equipped with advanced sonar which kept them relevant in the battlefield of the Cold War, primarily in the context of anti-submarine warfare. However, they suffered from a problem of insufficient space with respect to the ability to land helicopters on their decks. The US Navy therefore sought a small unmanned helicopter for these missions. The program began under the command of Admiral Burke in the late 1950s. At the time, the U.S. Navy had the ability to detect enemy submarines from a much greater distance than the range of their torpedoes. Therefore, tactics were developed that included early detection by the destroyer's sonar and then guiding an unmanned helicopter, armed with one or two torpedoes to the target. The unmanned helicopter could get to within a range that allowed for the firing of a torpedo and the destruction of a distant enemy.

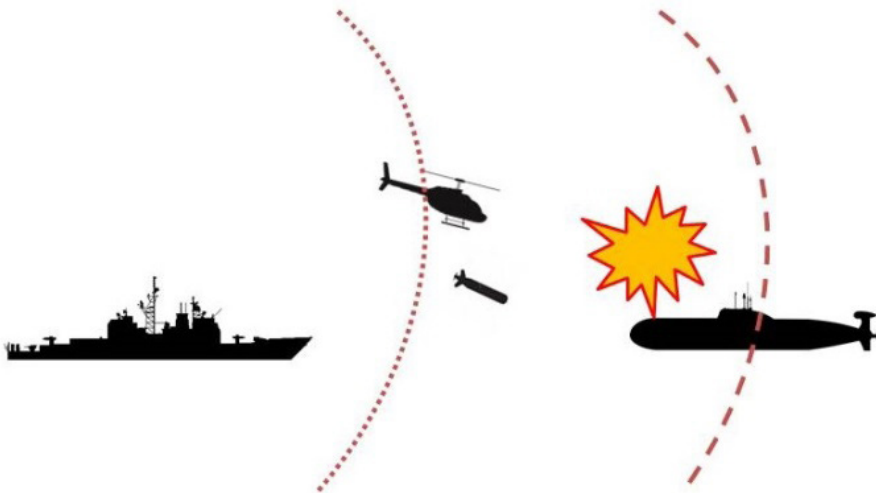


Figure 1: Tactics for use of a DASH unmanned helicopter against submarines

The maiden flight of the DASH helicopter took place in January 1960 and was jointly planned by the US Navy and the Gyrodyne company. In 1962, it was first deployed operationally on naval vessels. The plan included takeoff and landing by means of a remote operator on the deck and later control was to be transferred to the ship's command and control center.

4 The Americans during this period used the remaining helicopters as missile practice targets.

An additional model, called the SNOOPY, which was equipped with a camera that broadcasts a picture in real time back to the mother ship, went into service in January 1965. It provided information on the accuracy of fire from the ship's 5-inch guns. An officer serving on a destroyer came up with the idea, which he saw as enhancing the destroyer's firepower. The use of this model in the Vietnam War was considered to be a success, and this was essentially the first time that use was made of an unmanned aerial vehicle for intelligence purposes.

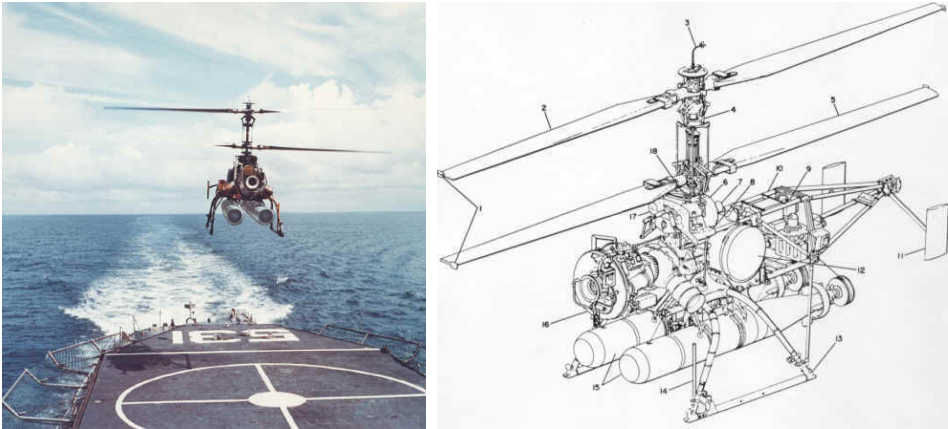


Figure 2: A DASH helicopter carrying a pair of torpedoes on an American destroyer (Gyrodyne.com)



Figure 3: A SNOOPY helicopter equipped with a camera and a transmission device (Gyrodyne.com)

Unmanned helicopters were in use during the 1960s and in the Vietnam War. Up until 1970, 750 units had been produced and had flown hundreds of missions. Their production was halted in that year. The data show that about one-half of them were lost while in service. Both the successes and failures were of great benefit to the advancement and development of unmanned helicopters.<sup>5</sup>

### The development process in Israel

The development process in Israel began in 1988. At the IAI, the unmanned helicopter was given the name HellStar. The Navy chose the name MITNOSES for the project. There were several reasons for the choice of the American unmanned helicopter as the basis for the Israeli development project: First, it avoided the need to plan a new design, which saved development time through the use of an off-the-shelf item. Second, the design was based on an existing unmanned helicopter that had already proven itself in various missions (as in the case of the development of the 'GABRIEL' missile which was based on the already existing 'LUZ' missile).

The development process can be divided into two parts from the point of view of technological complexity. The first included an upgrade of the unmanned helicopter based on the existing American mechanics. This meant using the dynamic system and rotors of the existing unmanned helicopter and adding to them the avionics and electronics of leading Israeli systems. Also added was the designated equipment that the unmanned helicopter would carry, including maritime radar, day and night vision devices, communication components and other detection and weapons systems developed in Israel. The technological challenge was to provide high-capability systems on the one hand but not to exceed the maximal weight of the designated equipment, which would directly affect the helicopter's performance with respect to maximal time in the air, on the other hand. At that time, some experience had been accumulated in Israel with unmanned vehicles and components of this type were already to be found in various configurations. This part of the development process is complicated and also included known components that had been planned on paper, but never built by the IAI. Therefore, there was a need for a major modification followed by several more cycles on a smaller scale; this process would involve two or three cycles of development. The complexity of the development process was ranked as "2" on the Bonen Scale.<sup>6</sup>

5 Benjamin Armstrong (2013), Unmanned naval warfare: retrospect and prospect, *Armed Forces Journal*.

6 The Bonen Scale is a method for planning and tracking a development process. It was invented by Dr. Zeev Bonen, former CEO of Raphael Industries. "Raphael: from Laboratory to System", Dr. Zeev Bonen and Dan Arkin. *NDD Media* 2003, p. 126. [Hebrew]



Figure 4: The MITNOSES (generously provided by Leor Margolin)

The second part, from the viewpoint of technological complexity, included capabilities that were lacking in the original system, which were not available from the defense industry in Israel and furthermore were technologically complex on their own at that time. The development of automatic takeoff and landing ability essentially involves the development of a digital automatic pilot for the helicopter, which was developed in Israel for the first time and was among the first to be developed in the world. To this end, thousands of digital simulations of a landing on a corvette were carried out on a small landing pad under various sea conditions, including a ship being rocked randomly and travelling at various speeds. In addition, the process required the development of a device for the automatic anchoring of the unmanned helicopter on the ship after landing.<sup>7</sup> Automatic landing of an aerial vehicle on a ship out at sea constitutes a complex engineering problem involving a moving platform (the helicopter's three degrees of freedom opposite the ship's three degrees of freedom). The need for an automatic takeoff and landing system, which had never been developed in Israel and only to a limited extent abroad, increased the complexity of the project to a ranking of "3" on the Bonen Scale. Even if there is an existence theorem for the suggested solution, it is not always chosen as the correct solution and therefore there are a number of development iterations that include unsuccessful solutions and another approximately three iterations until the final solution is achieved.

7 There was a need for changes in the ship that would enable the deployment of the helicopter. These included a telescopic hangar system and an elevator. To this end, contact was made with a Canadian company called Indal, which specializes in anchoring and conveyance of helicopters on board ships.

## The trial stage and the termination of the project

The first test flight was in June 1990, and in total there were 13 of them. In some of them, the unmanned helicopter was tied to the ground and it took off up to a certain height and then landed. In addition, there was a test of running the engine on the deck of a ship at sea.

In one of the tests, a flaw was revealed in the gyro system and the helicopter was damaged during a "heavy" landing. There are those who believe that this failure led to the decision by the Navy to cancel the project in 1992. Members of the IAI claim that the project was cancelled due to a lack of financing since the Navy found it difficult to fund its share of the development costs. In the end, the MITNOSES project was canceled in early 1992 and since then the Navy has used only manned helicopters in its various missions.

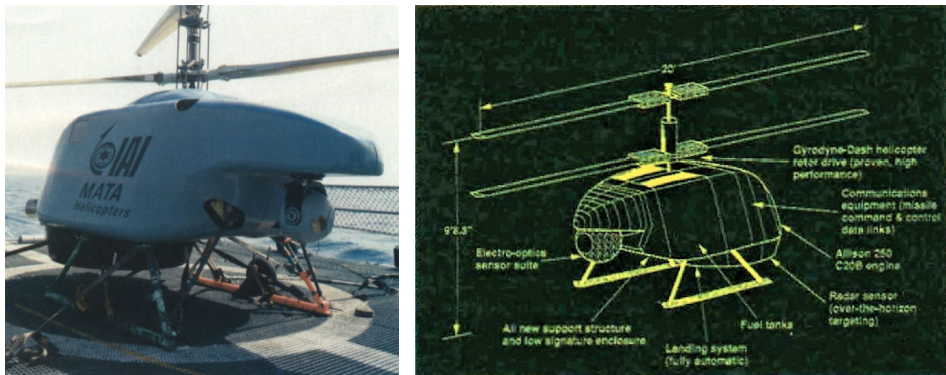


Figure 5: On the right is a test of the unmanned helicopter on a Navy ship. On the left is a drawing of the MITNOSES (generously provided by Shmuel Arbel)

## An analysis of innovation

Israel's MITNOSES project and its "father", the American DASH were innovative in several aspects. First, **innovation in time**: The American unmanned helicopter was developed in the 1950s when helicopters and their use in combat was in its early stages. Late in World War II, the first use was made of helicopters for military purposes. The widespread use of the military helicopter came later and reached a peak during the Vietnam War in the 1960s. During that war, the helicopters served as a primary platform in all aspects of the fighting. The development of an unmanned helicopter during that period was certainly considered to be innovative. It is worth



mentioning, for purposes of comparison, that the use of unmanned aerial vehicles became widespread only after decades of using planes for various purposes.

Another aspect of innovation is **technological innovation** and the use of applied science to these projects. The unmanned helicopter being discussed here was the first unmanned vehicle in use during the very early stages. The ability to remotely operate a vehicle with this level of mechanical complexity was very advanced for that period. In addition to the remote control technology, it also involved the mechanical component of a double rotor, which has numerous advantages. One of them is the relatively small dimensions of the helicopter since there is no need for a tail rotor for stabilization – a major advantage when operating from ships. Another is that a (coaxial) double rotor provides higher levels of speed and agility.

The helicopter also provides **doctrinal innovation**, which is manifested in anti-submarine warfare tactics. These tactics answer an operational need by exploiting the advantages of existing sonar and solving the problem of the torpedo's short range at that time. The American unmanned helicopter was the link that made it possible to destroy distant enemy submarines. The Israeli navy had experience in the adoption of an innovative approach to naval warfare that employs detection by means of radar on the aerial vehicle, without exposing the location of the mother ship. In addition to this type of vehicle, the ability had been achieved to assist in the guidance of over-the-horizon missiles and to carry out battle damage assessment (BDA) without endangering human life.

The idea of independently operating an unmanned helicopter in the Navy was a manifestation of **organizational innovation**. The innovation in operating an independent aerial vehicle eliminated the need for a mechanism to integrate the Air Force in naval operations. The relations between the Navy and the Air Force are complex. In Israel, the development of independent air power for the Navy, as it exists in the larger navies, is not feasible from a budgetary point of view. Currently, the naval helicopters are maintained by the Air Force and its crew members are Air Force pilots. This has advantages with respect to the quality of training, the skill level and the abundance of experience. Additionally, the squadron that operates these helicopters is dedicated to the needs of naval missions. However, there are also disadvantages of the current format. One is the need to coordinate the operation of the helicopters with the Air Force, which limits operational independence, and this mechanism involves an operational cost in wartime.<sup>8</sup> The second is that operation

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8 The operation of land-based unmanned aerial vehicles for maritime patrols (as part of the Maritime Patrol Branch of the Navy) also involves a level of coordination with the Air Force.

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of a manned helicopter from a ship requires that attention be devoted to the risk to the pilots and this becomes a burden on the crew of the ship. According to one of the individuals interviewed for this article, the ship becomes encumbered by the helicopter to some extent. Furthermore, the Navy proposed that the operators on the ship who have the responsibility for operating the 'GABRIEL' missiles in the early stages of launch would be trained to operate the unmanned helicopter since they have the required skill for remote operation of that type.

### The military use of innovation

The Israeli unmanned helicopter was meant to meet the following operational needs: 1) the use of radar and other sensors for the detection of targets without giving away the location of the mother ship; 2) in the case that the unmanned helicopter is detected, there is no danger to human life; and 3) the operation of aerial vehicles under direct control of the ship's commander without the need for coordination with the Air Force that limits control capabilities in combat. There is potential for using unmanned helicopters in maritime missions of various kinds: participation in naval combat – detection and identification of vessels for the Navy's corvettes; guidance of the Navy's ships to over-the-horizon targets; anti-submarine warfare; maritime search and rescue; air-sea transportation; participation in aerial-maritime patrol activities; etc.

### The reasons for the failure of the MITNOSES

The interviews I held on the topic of the MITNOSES episode in the Navy left a feeling of missed opportunity. The evidence points to a major potential for the program, which was nonetheless cancelled. I will present some of the main factors involved that are related to innovation:

1. **Technological maturity:** Unlike the American project which was developed during the 1960s, the Israeli project was evaluated during the 1980s. This is an important point with respect to the claim of technological maturity and the question of innovation that was ahead of its time. In the American case, these claims had a foundation, as was discussed above. But the Israeli case was quite a few years later, during which the technology had advanced to a much higher level. However, there were two technological requirements that constituted obstacles in the development work. The first was the equipment load carried by the helicopter, which includes maritime radar and night and day vision devices, which had to be under the maximal weight threshold in order not to harm the performance metrics of the helicopter and in order to meet the Navy's condition for minimal time in the air. The second requirement was that it have

an automatic takeoff and landing system, rather than being controlled by an external operator. A digital automatic pilot was a relatively complex matter in those days and required a long and complicated development process, which had not been done previously in Israel. On one of the first test flights of the system, there was a technical mishap and the helicopter was damaged on landing. There are those who view this incident as the catalyst for the termination of the project. Furthermore, there is a not insignificant amount of risk in operating an automatic pilot system of this sort out at sea. Landing on a ship out at sea without human involvement increases the risk to the ship and its crew, although I have heard varying opinions with regard to the need for this capability. As mentioned above, the takeoff and landing of the Americans' unmanned helicopters was by means of a human operator. However, the decision makers in the IAI and in the army had concluded that this is the only option. One can speculate that this capability made the project more complex and required innovation that was ahead of its time. From the Navy's perspective, there were major problems that became clear during the development and in the marginal operational envelope demonstrated by the project.<sup>9</sup> It is important to mention that for the IAI and MAPAT the problem was not technological but rather budgetary.<sup>10</sup> MAPAT did not identify a technological lag that justified its intervention in the technological process; neither did it continue with the development of remote control technology since at that time there were no customers other than the IDF.<sup>11</sup> The approach that MAPAT adopted and continues to adopt is that any manned vehicle can be replaced an unmanned vehicle.<sup>12</sup>

2. **Budget and financing:** The budget that was made available for the development of the system did not match its complexity. The Navy found a creative solution through assistance in financing from a foreign country, which led to its interest in the potential of this project. That country was ready to invest the lion's share of the project's cost, but at the same time this made the process of determining the specifications more difficult and it tried to reduce development costs. From time to time, there was tension against this background between the IAI,

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9 Interview with Brigadier General (ret.) Alex Eyal who was the Head of the Weapons Department during that period and who recommended the termination of the project.

10 Shmuel Arbel stated that despite the technological challenge it was possible to arrive at a solution if sufficient budget had been allocated. Indeed, during the years following the termination of the project, a number of unmanned helicopters of this type were developed by the IAI and other industries in Israel, some of them in cooperation with foreign companies.

11 Interview with Yair Gilboa who was the Head of the Air and Propulsion Branch at MAPAT during the years in which the project was developed.

12 Interview with Aryeh Tsur, supporting engineering at MAPAT.

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the Navy and that country's navy. It is worth mentioning that although many projects that have been developed in the defense sector have suffered to some extent from under-budgeting, in this case there was a solution in the form of a third party. It is also worth mentioning that unlike the unmanned aerial vehicles used by the Air Force or by the Intelligence Corps, which are bought in relatively large numbers, the Navy is a small customer which orders a limited number of systems (in total there was two Hohit ships that can carry a helicopter in addition to three Saar 5 ships that was planned to arrive in the future).<sup>13</sup> There is also a potential for exporting the system and there is an interested customer. At the end of the day, the development was allocated financing from the IAI and the Navy. However, the attempt to persuade the foreign customer failed. The Navy decided to cancel its financing in view of the difficulties in development, the need for additional budget and the additional time needed for development.<sup>14</sup>

3. **Disagreement within the Navy:** During those years, the debate over the optimal size of the ships that the Navy should acquire was at its peak.<sup>15</sup> The "large vessel" approach, which supported the acquisition of the SAAR 5 model, won the argument in the end, which also had an effect on the MITNOSES project. This is because the SAAR 5 ships can carry large manned helicopters and it may that there were decision makers who viewed the unmanned helicopter as a kind of threat to the option of acquiring large ships.
4. **Lack of maturity in the Navy for this type of project:** The interviews with professionals in MAPAT and in industry identified a number of problems in the Navy with regard to this project. First, there was a problem convincing the senior echelon in the Navy that this is an essential project and accordingly that the financial investment was necessary. Second, the Navy did not have a fully crystalized operational strategy with regard to the operation of unmanned vehicles from the decks of its corvettes. Third, there was a conceptual difficulty in accepting the risk of landing unmanned vehicles on a ship out at sea. Finally, there was an impression that the dimensions of this project were beyond the capabilities of the Israeli Navy.

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13 The 3 Israeli corvettes (SAAR 5 model) entered operational force between 1993-1995

14 Shimon Eckhoz, the CEO of RAMTA at that time, recounted that from the moment that the Navy halted the financing of its portion of the development, there was no possibility for the IAI to finance the project independently.

15 There were two schools of thought in the Navy. According to the first, it was preferable to acquire large ships with a long range at the expense of speed and also of quantity (since they are more expensive). The second supported the acquisition of a large number of small and fast ships.

5. **Conservative attitudes and opposition in the Air Force:** The approach toward the operation of unmanned aerial vehicles underwent a major transition. In the early 1990s, the Air Force operated a number of types of unmanned aerial vehicles, but its attitude to this issue was complicated since it viewed unmanned aerial vehicles as a threat to the use of the Air Force's pilots and the faith in manned planes. It is worth considering whether that approach—which no longer exists—was indeed the reason for terminating the unmanned helicopter project during that period. Furthermore, account should be taken of the fact that the Air Force naturally opposed any aerial solution that was not under its authority. A figure who was involved in this matter stated that from the viewpoint of the Air Force, "Anything that flies should belong to it" and that that is at the root of its opposition to such projects.

Opinions are divided as to the reasons that led to the failure of the project in Israel. The various entities involved in the project present different reasons and emphasize different obstacles. A fact that no one disagrees with is that even after 30 years there is still no unmanned helicopter on the Navy's corvettes and that investment is still channeled primarily to manned helicopters, namely the American Seahawks which are planned to replace the current 'ATALEF' helicopters.

## Conclusion

The MITNOSES project described here involved innovation of various types: innovation in time both in the American context of development in the 1950s and in the Israeli context of the 1980s; doctrinal innovation in anti-submarine warfare and naval warfare; technological innovation and the use of applied science in double-rotor mechanics and the remote operation of unmanned vehicles; an attempt at organizational innovation by the Navy involving the independent operation of aerial vehicles; and the acquisition of innovation from the post-modern US navy.

The reasons for the failure in the US during the 1960s can be explained by the lack of technological maturity. But in the context of Israel at the end of the 1980s and the beginning of the 1990s this claim needs to be examined carefully. The developmental considerations included the choice of an existing system in order to save costs and time and then to upgrade it according to the Navy's requirements. The problem of the weight of the helicopter's equipment load to the point that the unmanned helicopter could not stay in the air for a sufficient amount of time is unclear, since the defense industry already had experience during that period in developing various systems for unmanned aerial vehicles. It can be hypothesized

that the requirement for an automatic landing system was ahead of its time and created a technological obstacle for the project. It may be that with a larger budget it might have been possible to overcome this obstacle; however, other considerations, namely conservative attitudes and tensions within the Navy and between the Navy and the Air Force, contributed to some extent to the termination of the project.

The Navy faces a complex reality, particularly in the Eastern Mediterranean. The Eastern Mediterranean is dense with the vessels of various navies, both those of the Middle Eastern states and those of the superpowers. New challenges have been added to the Navy's traditional challenge of protecting the coasts of Israel, including protection of maritime strategic assets, and in particular the various energy facilities. Considering all of the above, the question arises as to whether the Navy is optimally prepared for the various threats, some of which are asymmetric. Unmanned aerial vehicles are used on a large scale by the Air Force today and also in the maritime context; however, the issue of tactical unmanned helicopters and its potential raise the question of whether there isn't a major lost opportunity in this case.<sup>16</sup> Imagine a small, fast and unmanned helicopter, armed with sophisticated sensors and other equipment, that is permanently stationed on a ship and can be fully and independently controlled by its immediate commander, without the need for coordination with others, and which can serve as part of the intelligence and operational network in wartime, whether in defensive or offensive combat...

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16 And in particular against the background of the naval helicopter accident in 1996 which also led to the shift to unmanned aerial vehicles.

