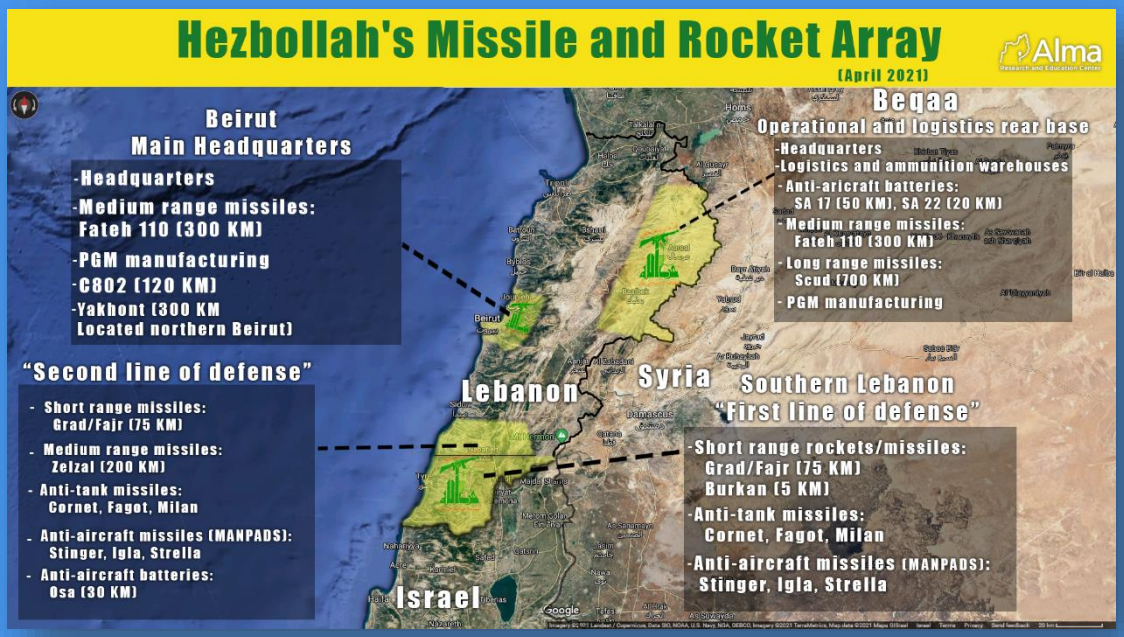

Hezbollah's Missile and Rocket Arrays: A Tough and Complex Challenge for Israel

(May 2021)

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Research and Education Center

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Executive Summary:

The radical Shiite axis led by Iran has been deployed through its proxies throughout the Middle East. The Axis' military capabilities, with an emphasis on missile use, are numerous and advanced. These capabilities directly and immediately threaten the Axis enemies in the Middle East, led by the United States, Israel, Saudi Arabia and the Gulf states, which have diplomatic relations with Israel such as the United Arab Emirates and Bahrain.

Hezbollah is the main proxy threatening Israel. All of Hezbollah's missile and rocket arrays, especially the precision missiles, have the potential to cause immense damage to the State of Israel and to the IDF. These arrays will be a difficult and very complex challenge for Israel in the next war, both in the civilian and military aspects.

In the next escalation, Hezbollah intends to operate these arrays in full force, with an emphasis on the surface-to-surface missile/rocket array, with the intention of generating damage to the hinterland and to the civilian (power plants, sea ports and airports) and military infrastructures (headquarters, bases, etc.) of the state of Israel. Such an attack, according to Hezbollah's methodology, would disrupt the IDF's plans and impair its maneuvering and warfare efforts inside Lebanese territory.

The precision-guided missile (PGM) project is a *red line* for the State of Israel. Israel will not allow Iran-sponsored Hezbollah to locate precision-guided missile factories throughout Lebanon. In our opinion, Israel will act in every possible way, visible or otherwise, in order to prevent the continuation of the missile accuracy project.

The anti-aircraft missile array poses a challenge to the Israeli Air Force's freedom of action. The Israeli Air Force is a central factor in the defeating of Israel's enemies. In addition, this missile system can pose a threat to air traffic in the northern part of Israel.

The surface-to-sea missile array is also an immense threat. A surface-to-sea missile system can undermine the IDF's freedom of maritime operation. In addition, this system can damage Israeli gas rigs and thus severely harm Israel's energy sector. Moreover, these missiles pose a threat to ships arriving at Israel's naval ports (especially the largest naval port in the northern city of Haifa). This threat could result in a *de-facto* blockade of Israel and severe detriment to Israel's imports (of which most arrive by sea).

Hezbollah's working assumption is that the IDF will enter Lebanon in the case of escalation performing a maneuver while taking over geographical areas inside Lebanon. In this scenario, the IDF will utilize many ground forces consisting of armored and tank forces and infantry forces.

Hezbollah's anti-tank missile array consisting of very advanced missiles with a range of several kilometers will wait for IDF forces to enter Lebanon from the ground.

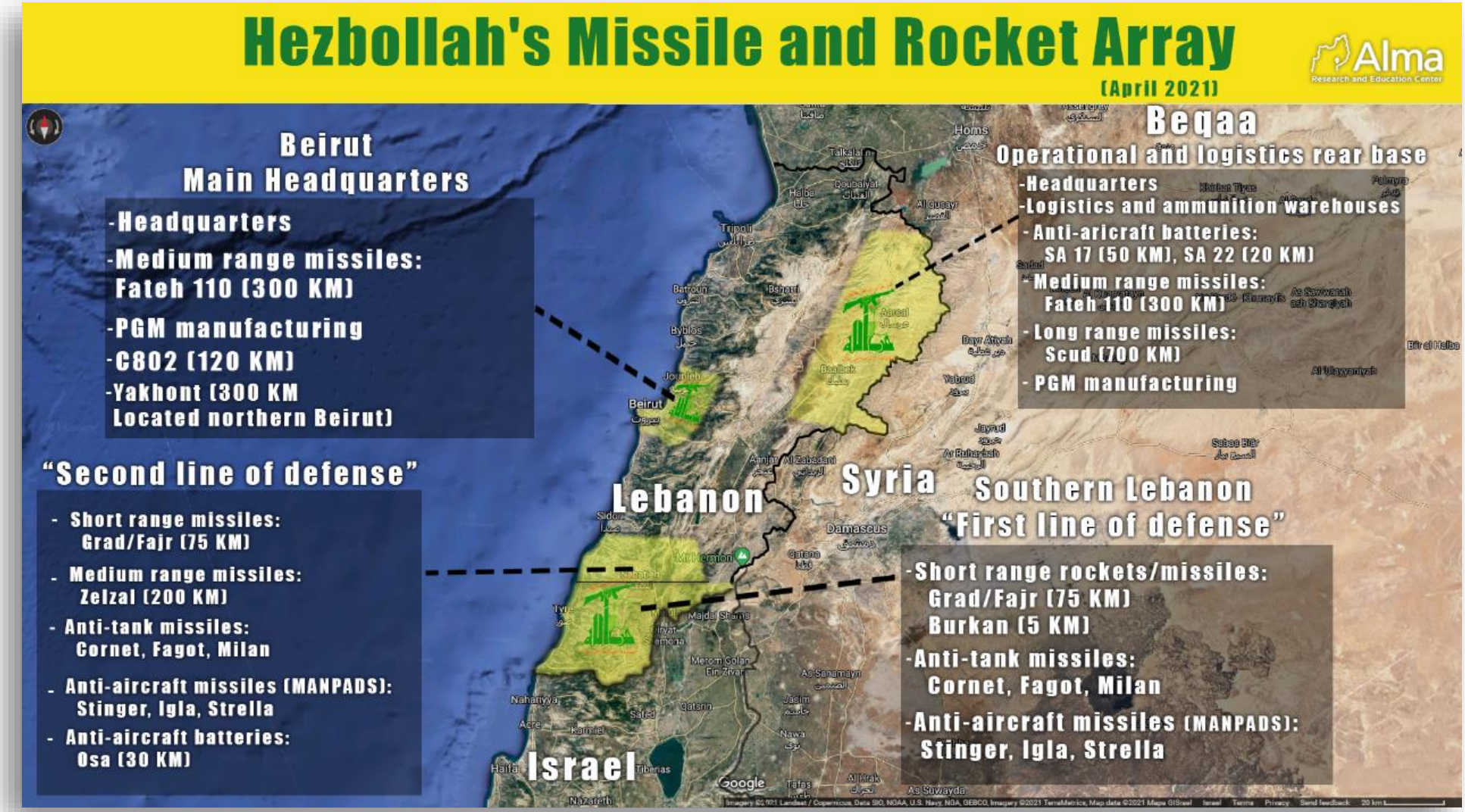
These missile arrays are deployed in all 200 Shiite villages in the area south of the Zaharani River up to the border with Israel and the adjacent areas have become part of Hezbollah's military infrastructure and are part of from what is called by Hezbollah **"the organization's regional defensive plan".**

This "defensive plan" is actually based on two "lines of defense". The "first line of defense" stretches from the Israeli border up to the Litani River, and the **"second line of defense"** stretches from north of the Litani River across to the Zahrani River.

Hezbollah will launch missiles at Israeli communities within Israeli territory and at IDF forces from houses in the villages and areas adjacent to these villages using the Lebanese as human shields.

IDF Chief-of-Staff Lt.-Gen. Aviv Kochavi addressed the subject of Hezbollah's rocket launchers and missile arrays in his January 26 address to the Tel Aviv University's Institute for National Security Studies (INSS):

"In the next war, Hezbollah's array of launchers, missiles and rockets will be activated at full force. Many missiles and rockets will fall throughout Israel, and it will not be simple...The enemy has chosen to place its weapons, missiles and rockets among urban areas exploiting the local population as human shields...The IDF will carry out intensive attacks on these missile-launching and weapons-storage sites, whether they're out in the open space or adjacent or inside buildings ...It is our duty to attack the tens and hundreds of rocket and missile launchers deployed in or near populated houses. Such an attack will prevent harm to Israeli citizens' homes and thus prevent the loss of dozens of people's lives..."


Hezbollah's Missile and Rocket Array
(April 2021)
Alma Research and Education Center
Beirut
Main Headquarters
-Headquarters
-Medium range missiles:
Fateh 110 (300 KM)
-PGM manufacturing
-C802 (120 KM)
-Yakhont (300 KM
Located northern Beirut)
"Second line of defense"
- Short range missiles:
Grad/Fajr (75 KM)
- Medium range missiles:
Zelzal (200 KM)
- Anti-tank missiles:
Cornet, Fagot, Milan
- Anti-aircraft missiles (MANPADS):
Stinger, Igla, Strella
- Anti-aircraft batteries:
Osa (30 KM)
Beqaa
Operational and logistics rear base
-Headquarters
-Logistics and ammunition warehouses
- Anti-aricraft batteries:
SA 17 (50 KM), SA 22 (20 KM)
-Medium range missiles:
Fateh 110 (300 KM)
- Long range missiles:
Scud (700 KM)
- PGM manufacturing
Southern Lebanon
"First line of defense"
-Short range rockets/missiles:
Grad/Fajr (75 KM)
Burkan (5 KM)
-Anti-tank missiles:
Cornet, Fagot, Milan
-Anti-aircraft missiles (MANPADS):
Stinger, Igla, Strella
Lebanon
Syria
Israel
Beirut
Damascus
Homs
Tripoli
Sidon
Tyre
Haifa
Tiberias
Nazareth
Acre
Safed
Nahariyya
Google

Hezbollah missile launchers:

Hezbollah has a very large number of missile launchers, some mobile and some stationary, allowing it the ability to launch its missiles repetitively. **Hezbollah has an estimated capability of firing up to 2,000 missiles and rockets in one day.**

The current estimate asserts that there are several thousand-missile launchers of all types. The short-range missile launchers allow the simultaneous and multiple firing of rocket salvos.

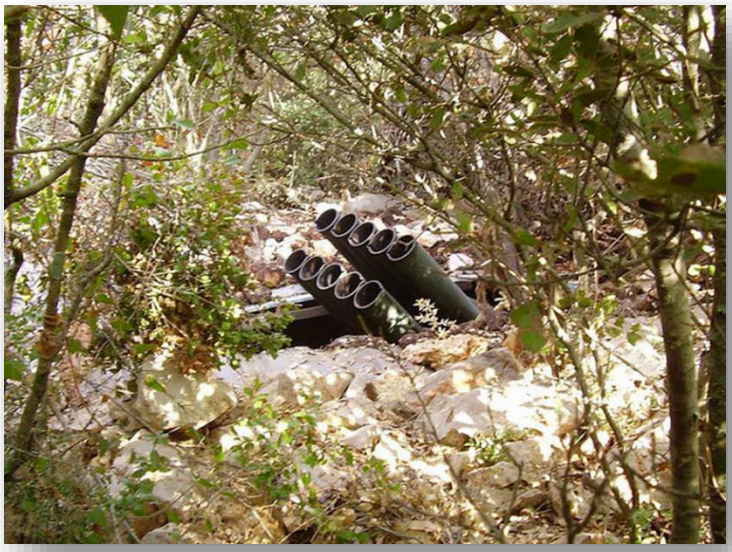
These missile launchers are deployed throughout Lebanon, particularly in the area of southern Lebanon, which is considered the frontier with Israel; it is from this area that most of the short-range missiles will be launched towards Israel.

A large number of the missile launchers in southern Lebanon are stationary launchers, concealed within the civilian population, using them as **human shields** with the intention of preventing an Israeli attack on these arrays.

(*Photo credit: IDF Spokespersons Unit*)

The missile launchers are located in villages, plantations and agricultural areas, hidden inside buildings and installed with hydraulic mechanisms enabling the rooftop to open upon the launching of the missiles from within.

Other missile launchers are concealed underground and are shrouded with camouflage. When activated remotely; the camouflage cover opens automatically; the missiles emerge and launch towards the pre-destined target.



(Photos from: https://www.terrorism-info.org.il/he/18586)

In addition, there are mounted mobile missile launchers, able to be re-positioned at will. Launching arrays of medium to long-range missiles are deployed in Beirut and the Beqaa area. These missile launchers are usually mobile and can be found on medium/large sized vehicles (trucks).

Pictures of Iranian launch trucks of various types have been made public in recent years. These vehicles include the possibility of disguising the launch facility, giving the vehicle a common civilian appearance. The concealment is achieved through a system of rails and curtains, which stretch over the weapon in order to hide it. **We know that Hezbollah has this type of "civilian" trucks:**

Types of missiles

There are three types of missiles categories: Surface-to-surface missiles, anti-aircraft missiles, surface-to-sea missiles, and anti-tank missiles:

The surface-to-surface missiles:

The surface-to-surface missile Types are divided into 3 subcategories: short, medium, and long-range missiles:

a. Short-range missiles, also called rockets, have a range of 0-100 kilometers. Their deployment is mainly in southern Lebanon.
b. Medium range missiles have a range of 100-300 kilometers. Their deployment is mainly in Beirut and Beqaa.
c. Long-range missiles have a range of beyond 700 kilometers. Their deployment is in Beqaa.

It is estimated that Hezbollah has an approximate total of around 150,000 missiles/rockets in its arsenal:

a. Tens of thousands of short-range missiles/rockets.
b. Between hundreds and thousands of medium-range missiles.
c. Dozens of long-range missiles.

These are the main types of missiles by ranges:

a. **The most common short-range missiles/rockets are the** "Grad" rockets, with a range of up to 40 km, the "Fajr" rockets, with a range of up to 75 km.
b. The "Zelzal" missiles with a range of up to 200 km and the "Fatah 110" missile, or in its other name: the "M-600" missiles, with a range of up to 300 km, **function as Hezbollah's main medium-range missile system**.
c. **For launching missiles to ranges over** 300 to 700 km, Hezbollah can use its "Scud D" missiles.

Regarding the short-range rockets, it is also worth mentioning the "Burkan" rocket. The "Burkan" is a very short-range rocket (with a range of up to five kilometers) containing a unique number of explosives. The weight of the explosives in the "Burkan" rocket can reach up to 400 kg. This rocket, developed during the Syrian civil war, is intended for short-range combat, with an emphasis on built-up residential areas. When such a rocket falls in a crowded, built-up area, its damage potential is enormous.

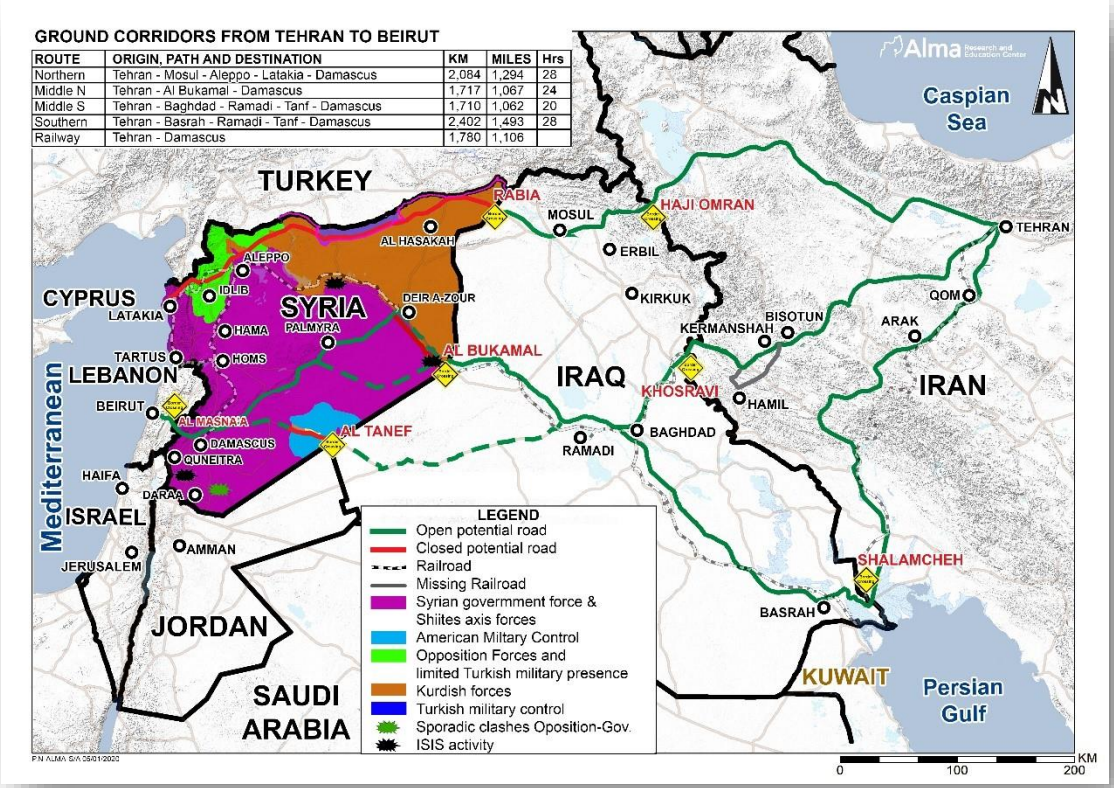
During the Syrian civil war, the Syrian army, backed by its Russian and radical Shiite axis allies, would lay siege on an area or a town it intended to conquer. During such a siege, the attacking forces would rain a massive bombardment on the area. Such a bombardment would crush and destroy all buildings. The "Burkan" rockets were a major tool in the devastation.

Above: the "Burkan" rocket.

Hezbollah has "Burkan" rockets and can activate them in two operational modes. The first mode is the raining of a massive bombardment on Israeli communities and military bases (or concentrations of military forces) located very close to the Lebanese border. There are numerous Israeli communities along the Israeli border with Lebanon. **The second mode is** the bombarding of IDF forces maneuvering inside Lebanese territory, with an emphasis on maneuvers within built-up areas.

The precision missile project:

Weapons smuggled into Lebanon by air, sea and land mainly from Iran and Syria. From Iran they come through the three routes and from Syria they come via the land. Sometimes the arrival of the weapons is done in a combination of the routes. The integration is usually carried out on flights carrying weapons from Iran to Syria and from Syria the weapons are transported by land to Lebanon.



Beginning in 2013, under the auspices of the Syrian civil war, **Iran began delivering precision-Iranian missiles through the "land corridor" from Iran to Syria, with Hezbollah in Lebanon being the final destination**. The responsibility for implementing the transfer of the missiles was assigned to the Lebanese corps of the Quds Force, which is subordinate to the Islamic Revolutionary Guards Corps (IRGC). This effort lasted for about two years, until the year 2015, when the vast majority of consignments were thwarted by air force activity.

In light of the failure, Iran decided to change its modus operandi, and in 2016, began to upgrade local Syrian manufactured missiles at the SARS Institute. However, most attempts to transfer these missiles from Syrian soil to Lebanese soil destined for Hezbollah were also thwarted. In 2018 there was a change in the Iranian perception, determining that the manufacturing precision missile installations would be transferred to Lebanese soil on the assumption that Israel would not attack them. The "raw materials" for the project were transported via the aforementioned three routes: the land corridor, the maritime route and by air (for example, via direct “civilian” flights from Iran to Beirut).

https://youtu.be/XIQzIuLLJgE

To this day, there still are immense technological difficulties implementing the precision missile project, its goals not yet met. Hezbollah currently does not have the capability to serially manufacture precision missiles. However, since not all consignments were thwarted and some missiles managed to slip through, **Hezbollah is estimated to have only a few dozen precision-guided Fatah 110/M-600 medium-range missiles (up to 300 km), with a striking radius capability of a few meters.** The threat is clear: Hezbollah has the capability to precisely strike strategic targets throughout Israel. The precision guided missile project has not yet achieved its strategic goals, not for the lack of technology or motivation, but for the lack of the ability to transfer technological knowledge and raw materials.

Under Iran's auspices, Hezbollah continues to promote the precision missile project and uses Lebanon's civilian population as a human shield to protect this project. Hezbollah situates the precision-guided missile production installations in the heart of the civilian environment, above and below ground throughout Lebanon and even in Beirut.

The precision missile project is a *red line* for the State of Israel. Israel will not allow Iran-sponsored Hezbollah to locate precision-guided missile factories throughout Lebanon. In our opinion, Israel will act in every possible way, visible or otherwise, in order to prevent the continuation of the missile accuracy project.

https://youtu.be/Przcf2SGwV0

On the subject of the launch sites, the storage and production of the medium-range missile arrays in Beirut see Alma's special reports we published:

1	Exposé: 28 Missile Launching Sites in Beirut – Hezbollah's Use of Civilians as HUMAN SHIELD	July 2020
2	Hezbollah's Missile Array (" Fatah 110") – Unveiling Four New Sites in Beirut	February 2021

On the subject of the Waqf educational complexes in Burj Al-Barajneh performing as human shields, see Alma's special report we published:

1	The "Islamic Shiite Waqf Committee in Burj al Barajneh" foundation and its connection to Hezbollah's medium-range missile array ("Fatah 110") launch sites in Beirut	January 2021
2	Alma's integrated map of suspicious sites in Beirut	

In relation to the explosion in Ein Qana that revealed the camouflaging and concealment technique relating to the human shield tactic around the storage of weapons in southern Lebanon, see the report we published in October 2020: The "Peace Generations Organization for Demining", owned by Hezbollah, is apparently a disguise for Hezbollah's "human shield" tactic!

Above: A camouflaged rocket launcher armed with a 110-missile atop a civilian truck.

Anti-aircraft ground-to-air missile array:

Another missile array Hezbollah is developing is an anti-aircraft ground-to-air missile array. A system divided into two: shoulder-fired missiles (man-portable air defense systems - MANPADS) and anti-aircraft batteries. The purpose of these missiles is to hit fighter jets, helicopters, missiles and UAV'S. Recently on February 3, we experienced a "taste" of such a system, when a shoulder missile fired upon an IDF Hermes 450 UAV that apparently was engaged in an intelligence-gathering mission over south Lebanon.

Hezbollah has several types of shoulder-fired missiles: the "Stinger" shoulder-fired missile made by the USA or "Igla" (also named SA-16 or SA-18 depending on the version) or "Strella" (also called a SA – 7) made by Russia.

In our estimation, the Stinger missiles were most likely transferred long ago to Hezbollah from the Lebanese army's ammunition depots.

IGLA-S MANPADS

STRELA

Hezbollah's intense involvement in the Syrian civil war has enabled it access to many types of weapons, including advanced Russian-made weapons from Syrian army weapons depots. Achieving accessibility also to anti-aircraft artillery arrays. Hezbollah may have trained on the SA17 and SA22 air-defense artillery batteries in Syria and these batteries may have found their way into Lebanon.

SA 17 ("Buk-Grizzly") has four missiles per launcher. Each missile can travel at the speed of Mach 4 and has a range of up to 50 km and an interception ability of up to a height of 25 km.

Above: SA 17 "Buk-Grizzly" missile system.

The SA22 ("Panzer") holds six missiles per launcher. Each missile can reach the speed of Mach 1.3 and has a range of up to 20 km and an interception ability of up to a height of 15 km. All components of the system are located on one vehicle (truck) carrying search and trace radar, missile launchers and cannons (the cannons are designed to intercept targets at low altitude).

In our estimation, these two types of batteries are deployed in the Beqaa valley.

Above: A 22 "Panzer". (https://www.vitalykuzmin.net/)

Hezbollah is also likely to have in its possession the SA-8 anti-aircraft systems. These missiles are mounted on a vehicle that includes radar and are named *Osa*. The components of the system, the missile launchers and the search and tracking weapons are mounted on one vehicle. The *Osa* has three missiles' launchers, each missile has an interception altitude of up to 13 km and a range of up to 30 km. **In our opinion, this system is also deployed in southern Lebanon in what is called by Hezbollah "the second line of defense".**

Above: SA-8 Osa.

The anti-aircraft missile array poses a threat to the Israeli Air Force's freedom of action. The Israeli Air Force is a central factor in the defeating of the enemy. In addition, this missile system can pose a threat to air traffic in the northern part of Israel.

Surface-to-sea missile array:

The third missile array is a surface-to-sea missile system. In this array there are two main types of missiles:

a. The first is the C-802 cruise missile made by China (Speed: 0.9 Mach, range: 120 kilometers, warhead: 165 kilograms). This type of missile struck an IDF naval ship in the Second Lebanon War in 2006 and nearly sunk it.
   We estimate that this system is deployed in the Beirut area and to the north. It is also possible that the system is deployed south of Beirut, according to foreign sources.
b. According to foreign sources, the second is a surface-to-sea (ships/rafts, etc.) P-800 *Oniks* supersonic cruise missile ("Yakhont"), made in Russia (Range: 12-300 kilometers, speed: 2.6 Mach (750m/s), 2 Mach at sea level). According to a geographical analysis we did, and according to the missile's specs, we estimate that this system is deployed in the area north of Beirut to Tripoli.

C-802/YJ-82

Yakhont

The number of surface-to-sea missiles is not known to us exactly. We estimate that Hezbollah has a few dozen of each type. These missiles are stored near the Lebanese coast and will be transferred to pre-prepared firing positions if necessary.

A surface-to-sea missile system can undermine the IDF's freedom of maritime operation. In addition, this system can damage Israeli gas rigs and thus severely harm Israel's energy sector. Moreover, these missiles pose a threat to ships arriving at Israel's naval ports (especially the largest naval port in the northern city of Haifa). This threat could result in a *de-facto* blockade of Israel.

Anti-tank missile array:

The number of anti-tank missiles used by Hezbollah is currently estimated at the many thousands. During the 2006 war, Hezbollah hit 52 Israeli tanks and five of them were completely destroyed. In recent years, the anti-tank missile reservoir has been significantly expanded, with the addition of Sager, RPG, Pagot and Milan missiles, as well as advanced Kornet missiles capable of penetrating the "Merkava" tanks.

Kornet missile Ольги Балашовой, Вадима Савицкого

The Cornet missile is the most advanced missile currently in use by Hezbollah. It hits targets by marking the with a laser beam, its range of impact is over six kilometers and it can penetrate steel of over one meter thick.

2 primary examples of Hezbollah's use of Cornet missiles occurred in January 2015 and in September 2019. In January 2015, several Cornet missiles were fired on IDF vehicles, resulting in the death of an IDF officer and soldier. The incident occurred close to the village Rajar on the western foothills of Mount Dov (Shebaa farms). In the second incident, Hezbollah fired 2 Cornet missiles at an IDF vehicle close to the community of Avivim.

Hezbollah's working assumption is that the IDF will penetrate Lebanon in the case of an escalation performing a maneuver while taking over geographical areas inside Lebanon. The IDF will enter Lebanon with many ground forces consisting of armored and tank forces and infantry forces.

These missiles are deployed in all 200 Shiite villages in southern Lebanon. They will be launched at IDF forces from the houses in the villages and areas adjacent to these villages.

Dealing with the challenge:

To deal with some of the challenges posed by the various types of missiles, the State of Israel has developed a number of countermeasures:

1. Several air defense layers consisting of "arrow" missiles, "magic wand" systems and "iron dome" systems against all types of surface-to-surface missiles and rockets.
2. The "Barak" system and a naval version of the "Iron Dome" systems to counter surface-to-sea missiles.
3. The "Windbreaker" system against anti-tank missiles that is mounted on tanks and can destroy missiles fired at the tank as it approaches.
4. Electronic protection systems and various radars.

It is important to note that the above countermeasures are not hermetic. It is possible that a major defensive effort will be directed to the protection of strategic and national infrastructures and not necessarily to populated civilian areas.

The extensive use of missiles by Hezbollah in the next confrontation will cause many casualties among civilians and soldiers, and heavy damage to military equipment and civilian infrastructure on the Israeli side. On the Lebanese side, while defending Israelis from this missile, the IDF will have to attack the weapons storages hidden in populated areas in Lebanon, risking collateral damage. In conclusion, in the next confrontation, the State of Lebanon and the State of Hezbollah will suffer severe civilian and military damage that will take decades to repair.