

MISSILE POWER

IN THE MIDDLE EAST



Edited by
Ahmed Eleiba

Foreword By
General. Mohamed KashKoush

MISSILE POWER
IN THE MIDDLE EAST

MISSILE POWER

IN THE MIDDLE EAST

Edited by
Ahmed Eleiba

Foreword By
Staff Maj. Gen. Prof. Mohamed KashKoush



The Egyptian Center for Strategic Studies (ECSS)

Missile Power in the Middle East

Edited by: Ahmed Eleiba

Foreword By: Staff Maj. Gen. Prof. Mohamed Kashkoush

ISBN: 978-977-86041-5-3

ISSN: 2021/26732

Copyright:© 2021 The Egyptian Center for Strategic Studies (ECSS).

All rights reserved

100 Al-Merghani St., Heliopolis, Cairo

+20226905861 | +20226905862 | +20226905863

info@ecss.com.eg

www.ecss.com.eg

CONTENTS

FOREWORD

- 1 | Missile Arms Race in the Middle East
Maj. Gen. Prof. Mohammed Allam Sayed
- 2 | Missile Defense System Issues in the Middle East
Ahmed Eleiba
- 3 | Anti-Ship Missiles (AShM)
Rear Admiral Mahfouz Mohamed Taha Marzouk
- 4 | Iran's Missile Force and Military Strategy
Marwa Ahmed Salem
- 5 | *Missile Capabilities of GCC States in the Face of Security Challenges*
Staff Maj. Gen. Capt. Imad Mohsen
- 6 | Israel's Missile Capabilities
Staff Maj. Gen. Prof. Mohamed Kashkoush
Staff Maj. Gen. Prof. Osama Ibrahim
- 7 | Turkey's Missile Capabilities
Staff Maj. Gen. Prof. Wael Rabie - Mohamed Hassan
- 8 | Egypt's Satellite & Missile Capabilities
Staff Maj. Gen. Prof. Ayman Fawzi Abdel-Hafez
- 9 | Missile Capabilities of Non-State Actors in the Middle East
Mohamed Mansour
Conclusion

Foreword

STAFF MAJ. GEN. PROF. MOHAMED KASHKOUSH*

The world's real military missile force was introduced during World War II (1939-1945). It was first introduced at the end of World War I (1914-1918) and during the time between the two world wars. In the beginning, the military force was represented in field artillery, first stationary, then towed, wheeled, tracked, and finally with self-moving.

The philosophy of using field missiles was to deliver military punishment to hostile targets, through military warheads containing high explosive materials initiated with TNT and their developments within a bowl and metalhead that could be dispersed as a result of the explosion to produce a large number of lethal fragments in its impact cycle dependent on the quantity, type and purity of the explosive material, with a large wave of air pressure and fire.

This philosophy reflects two objectives: the first is to increase the size of the destruction by increasing the warhead's size while increasing the range to the depth of the enemy associated with the propellant, which was later developed into liquid and then dry fuel, especially with ballistic and long-range missiles. The second is to reach distant targets deep within the enemy, without venturing to lose the pilots, the aircraft, or both,

*MEMBER OF THE ADVISORY BOARD OF THE EGYPTIAN CENTRE FOR STRATEGIC STUDIES

or to prepare the ground for airstrikes using missiles within range, and to suppress air defense elements around the target or on its routes, whether land, air or seaports or infrastructure affecting the overall capabilities of the hostile State. The origin and development of the missile included all major ground, naval, and air combat branches per Western military arrangements, and were augmented by air defense as a separate branch from the Air Force under Eastern military organizations.

Reflecting on the cases that the book deals with, mainly in the Middle East, the Western School countries are Israel, Turkey, and the Arab Gulf states, while Egypt and Iran belong to the Eastern School, although the latter partly belongs with the establishment of a major separate combat branch for missile force, to compensate for the weakness of their air forces since the fall of the Shah rule in 1979, and later went to the Soviet Union and China to build an alternative force.

First: The Emergence and Development of Missile Power in the Middle East

The emergence and development of missile power in the Middle East are linked to several important political and strategic considerations in the region. The most important of which, according to chronological order, was the establishment of the State of Israel amid Arab hostility, the Soviet arms deal for Egypt as the first arms deal for the region, and the subsequent pursuit of deals for most Arab states in the region. Missiles have become a major weapons system in the military structure of armies, which can be addressed in the following areas:

The Establishment of the State of Israel amid a Barrage of Arab Hostility

Israel's geostrategic and demographic weakness forced the newborn State to adopt a security policy that allows it to stay, continue and protect its entity. Despite the British-French-American military agreement and commitment, which secures its survival and superiority over its neighbors, it began early to cooperate in the acquisition of a missile power core used by the victorious allies of World War II, particularly France and the United States, in parallel with the development of its military industry, which resulted in many

missiles, such as Lance, Jericho, etc. In addition to many ground, air, naval, and air defense missile systems, which is considered a part of the Israeli Air Force.

A special air defense system, known as the “Iron Dome,” was also established to intercept Katyusha missiles from the Gaza Strip at low altitudes and limited passage times, which began against nearby Israeli colonies, then the range was developed in the Fourth Gaza-Israel War to reach Tel Aviv, bypassing the economic port and major oil installations in Ashkelon. Furthermore, for the first time, Hamas also launched a 215 km long-range missile to Ramon Base, south of the Negev, bypassing the Be’er Sheva, and its passage line was close to the strategic Dimona nuclear reactor, which entails additional structure to build a second range of that system with its strategic opening in the form of a half-circle from southern Gaza to western Jerusalem to Tel Aviv on the Mediterranean coast.

The Soviet Arms Deal for Egypt (1955-1956)

It was known as the Czech deal as it emerged from Prague; the Soviets were unaware of the aforementioned tripartite agreement. Additionally, this was the first deal to emerge from Moscow without being directed to Beijing and was a response to London and Washington’s refusal of Egypt’s request to arm its army, which was related to the Western school at the time. Washington also refused to fund the construction of the High Dam in response to Egypt’s refusal to participate in the Baghdad Pact to complete the containment of the southern Soviet Union.

The deal for the first time in Egypt contained BM21 field missiles, which played an important role in the sweeping Soviet counterattack during World War II from the Minsk-Kiev line, which ended in Berlin in April 1945 with the defeat of Germany, which led the Axis forces. The BM21 deal shifted the military power in Egypt’s favor vis-à-vis Israel, particularly in ground fire, which was one of the causes of the French-British-Israeli tripartite aggression over Egypt in October 1956, and before Egypt absorbed these weapons and the tactics of using the new Soviet school, the Soviet deal to Egypt became a prelude to the subsequent proliferation of Soviet armaments in most countries of the region.

The Spread of Soviet Missile Weapons in the Region

The Russian deal with Egypt, which included field missiles, was a foreshadowing of the region's proliferation of Soviet missile weapons, encompassing all Arab states save the Arabian Gulf states, Jordan, Morocco, and Tunisia. Furthermore, except for Ethiopia, it did not cover the majority of non-Arab powers in the region, and these countries are Israel, the Empire of Iran (pre- 1979), and Turkey, which later joined NATO by the beginning of the 20th century.

As a rising power, the Soviet Union was striving to set foot in the region, starting with Egypt, to compete with the West over areas of influence and a vast new market for the sale of its weapons as a new and important economic source, using competitive prices, splitting payments with grace periods, and accepting a portion of the payment price in the form of raw materials that it lacked, such as Egyptian cotton, where the Soviet Union had a large surplus of less sophisticated and less expensive World War II weapons. For example, Egypt and Syria fought the October 1973 War with these weapons in exchange for what Israel fought with the latest weaponry in the United States arsenal, especially air fighters, tanks, and many different missile systems.

Second: Missile Power Surge in the Middle East

The greatest quest for ownership was by most Arab states, which aimed to possess powerful armies in the face of Israel, which had both missile and nuclear capabilities. Those Arab states were defined as progressive eastward or radical westward; this was the axis established by President Gamal Abdel-Nasser and included all Arab states other than those with a monarchy. Most of the missile capabilities of that progressive axis came from the Soviet Union, especially SCUD B-Skull Board ballistic missiles. The other major Arab countries belonging to the Western School also possessed ballistic missiles not from the Soviet Union but from its ally, China, where Saudi Arabia -for example- owned silkworm-sic worm missiles. Additionally, the United Arab Emirates later possessed from multiple sources resultantly, this caused disruption to Israel as viewed by the United States and its allies, creating arms control initiatives for missile capabilities in the Middle East that would undoubtedly benefit Israel.

Third: Missile arms control initiatives in the Middle East

The term became widespread after World War II, forming the Eastern and Western camps with their NATO-Warsaw allies, and featured several missile systems based on their range and as a way of transporting nuclear warheads to their targets. To emphasize the significance of this, it should be noted that no summit conference between the two parties has been held without armaments control since the Bulganin-Eisenhower summit till the Bush-Gorbachev summit. Despite the heavy employment of missiles in the 1981-1988 Iraqi-Iranian war, reflected in the Middle East, none of the major powers, particularly the Western ones, advanced arms control initiatives, especially with the intense use of ballistic missiles from both sides. This was consistent with the required balance of weakness between Iraq and Iran, which would be conducive to the interests of the Arab Gulf states and Israel.

However, the situation differed completely after Iraq invaded Kuwait and before its liberation by an international coalition led by the United States, whereby the Iraqi ballistic missile force directly targeted each of the United States forces at one of its camps in Dhahran, east of Saudi Arabia, as well as the Israeli depth - for the first time - despite the smaller warhead to increase the range by increasing the volume of fuel. However, that was enough to launch several arms control initiatives in the Middle East, the most significant of which was President Bush's 1991 initiative to prohibit the transfer of advanced military technology to the Middle East, particularly ballistic missile technology, and to encourage Arabs with such missile capabilities; the initiative was appended with the phrase "With the beginning of solving the Palestinian issue."

During that stage, he possessed those missile capabilities and some of the following countries' technologies: Iraq, Saudi Arabia, Yemen, Syria, Egypt, Libya, and Algeria, which theoretically constitutes, due to long distances, the possibility of an Arab rally against Israel with a simultaneous bombardment of its depth as from Iraq, and Israel's inference of the possibility of secret Arab coordination as happened between Egypt and Syria in the October 1973 War. Nevertheless, the initiative's covert goal was to deprive the Arabs of their most powerful, above traditional armament systems, in exchange for Israel's exclusive possession of nuclear

weapons and capabilities, resulting in the modern classification of armament systems according to combat use.

Fourth: Modern Classification of Armament Systems According to Combat Use

The old classification, until the 1970s, included two main categories: conventional weapons and destruction arms. The latter included nuclear weapons, as well as chemical and biological weapons. The current classification retains conventional weapons, but according to the United Nations Convention on Certain Conventional Weapons issued at the beginning of the 1990s, nuclear weapons have a separate classification due to the severity of their destruction, chemical and biological weapons have been moved to the above-traditional class, then later on, what was developed were added to it, such as ballistic missiles and their counters, then military satellites, and finally, unmanned aerial vehicles, drones.

The remaining missile areas except “ballistic,” mean the special missiles of both the Air Force and the Air and Maritime Defense Force, and then the ground forces have multiple specialties and uses. The creation and development of the conflict between the main fighting branch and its counter-missiles can be summarized as follows:

- Air Force and air defense missiles: A combat aircraft, according to its qualitative specialty as an example, targets ground-based air defense missile sites to operate freely against the ground or sea targets, and vice versa, ground-based air defense missiles target hostile aircraft to protect and secure the main ground or sea targets assigned to secure them and so on. Moreover, the combat aircraft also targets hostile aircraft during air combat as one of the tactics and methods of air defense combat, both for the protection of land or sea friendly targets and the protection of parachute aircraft from the position of the air parachute, and the acquisition of air control in the field of air combat as a whole or parts thereof.
- Navy Force Missiles: they are separated into surface-to-surface missiles, which are launched from one surface ship to the other, surface-to-land, which target on or behind coast targets, whether against vital hostile targets or as part of the fire preparation for friendly sea landings. Additionally, there are surface-to-air as an air defense aspect of a ship or fleet, or surface-to-depths against submarines, often in the form of bombs, or from bottom-to-bottom,

i.e. to and from submarines in the form of torpedoes, or submarines against surface ships. Modern submarines can also launch ballistic and nuclear missiles from a diving position (Seabed).

- Ground force missiles: They are divided into two main types: field missiles, which belong mostly to the field artillery, anti-tank missiles in missile and tank conflict, which are constantly evolving and surprising. The tank increases the thickness or versatility of its armor and increases the range and variety of its fire to target the missile's pistons. The missile was also developed to increase penetration depth in steel and the guidance method from wire to laser guidance to smart heads using satellites, or the diversity of launch bases from the ground or vehicle-mounted to a helicopter, which has become an important air combat element for an armed or attack helicopter since the October 1973 War.

Fifth: The Middle East as the Largest Arms Market around the World

According to international arms reports, the region has witnessed multiple inter-state or intra-state military engagements or patterns of proxy warfare, as well as counter-terrorism operations and transnational organized crime, making the Middle East the world's largest arms market.

Sixth: Missiles, Satellites, and drones

Rockets, satellites, and unmanned aerial vehicles (drones) are parties to mutual cooperation that began in the military field and were extended to various areas such as communications and cyberspace. The beginning was when a Soviet space rocket carried, from a base in Kazakhstan in the 1950s, the first satellite in the world to orbit it around Earth, then after a few years, it was followed by another American missile and satellite from Cape Kennedy in Florida, then many other global missiles and satellite followed.

The correlation means that it was the rocket that brought the satellite into orbit around the Earth, and then, by contrast, it became the satellite that connected the heads of various smart combat missiles to their targets, bringing the accuracy of the impact to 100 percent with visual tracking to the target, which became available in most countries of the

Middle East region. It also developed later in the combat use of aircraft for the Drones, both for the aircraft itself and for the smart missiles they carry, which are also owned by all states of the region.

To date, production has been limited to Israel, Iran, and Turkey in accordance with the primacy of domestic military production, with an expansion and diversity in the actual combat use of both Israel in Syria and Iran against Saudi Arabia through the Houthis in Yemen, as a type of proxy war, which called for a major development of the Saudi air defense elements and capabilities, particularly from the United States.

Missile Arms Race in The Middle East

1

MAJ. GEN. PROF. MOHAMMED ALLAM SAYED*

As protracted conflicts continue in the Middle East region, the tools of conflict have evolved, varying among rockets, drones and other weapons of mass destruction created by modern technology that continues to provide deadlier, more far-reaching and more accurate weapons.

The US, China, Russia, and the European Union are competing to find a global market for their weapons, benefiting from exposing new weapons to real firing tests, huge revenues, domination and influence. It is therefore in their interest that wars break out and conflicts continue, so that the United States calls for leading missile defense cooperation under Arab-Israel normalization. Moshe Patel, President of the Israeli Missile Defense Organization, publicly indicated interest in working with the United Arab Emirates and Bahrain, based on the current American-Israeli cooperation in the missile defense sector. These countries have clear interests because they are threatened by Iran, which is moving steadily in the development of missiles and aircraft.

In fact, there are those who aspire to go beyond that, and would like to expand the activity in the future to include Saudi Arabia,

*ACADEMIC, ARAB REPUBLIC OF EGYPT

Qatar and other countries, to build stronger regional alliances countering Iran. This will reflect on competitiveness against China, North Korea and Russia. The urgency for greater defensive capabilities was demonstrated when the US Embassy in Baghdad was targeted with twenty-one missiles on December 20, 2020, the largest attack against a US facility since 2010.

The Importance of Acquiring Missiles

The military value of missiles stems from their ability to deliver strategic strikes while keeping the attacker's military personnel out of reach of enemy defense systems. Its operational advantages as a military tool have increased due to technological improvements, particularly in accuracy. Today, at least 10 out of 19 countries in the Middle East and North Africa possess ground-based or aircraft-launched missiles that can be used to attack high-value targets deep within other countries. Ballistic missiles played an important role during the Iran-Iraq war of 1980-1988; more than 600 missiles were fired targeting the main cities of the two countries in what was known as the urban war. By analyzing the costs and benefits, it was found that acquiring ballistic missiles is much cheaper than maintaining large conventional forces. This war has greatly changed the role of ballistic missiles in the region, and defense against ballistic missiles has become an issue of great importance to the countries of the Middle East. This resulted in a missile race in the region, and a tendency to become familiar with missile technologies related to use and deterrence.

In the Gulf War, Iraq launched dozens of ballistic missile attacks on both Israel and Saudi Arabia. In return, the United States and coalition forces fired about 300 rockets into Iraq. During the events in Yemen in 2015, the Houthis launched a Scud missile in June and a Hwasong-5 missile in August. It was said that in both cases they were intercepted by Patriot missiles.

Terrorism and The Effects of Destruction

A look at some of the recent military events that claimed many victims and left many traces of destruction reflects the extent of the catastrophic conditions experienced by the region.

- Last year, Iran launched ballistic missiles at Al-Assad air base, and the United States did not have enough Patriot interceptors; which means that missile defense systems today are expensive and therefore rare. With critical centers such as the Joint Air Operations Center in Qatar vulnerable to some extent, US Central Command had to relocate all elements of US command and control to an air base in South Carolina. The need for a guided-energy (i.e. laser) anti-missile system is becoming increasingly urgent.
- The Lebanese Hezbollah, Iran's ally, threatens to launch between 120,000 and 150,000 missiles over Israel from the north. Iran can now launch missile attacks and launch drones on Israel from its territory and from Syria and Iraq, and the Houthis in Yemen have threatened to launch missiles against Eilat in southern Israel.
- Since 2017, the Houthis have repeatedly threatened to strike the UAE, and attacked Abu Dhabi International Airport with a drone in July 2018. Iran has also directly threatened the UAE, and it can theoretically launch a huge variety of missiles, short-range drones, and long-range tactical missiles. Emirati forces in Yemen have been constantly under fire from Houthi drones and precision missiles, most notably when about fifty soldiers were killed in an attack on a camp in September 2015.
- Since 2015, Saudi Arabia has had to evacuate a number of countries along its southern border due to Houthi missile and drone attacks with the help of Iran. In 2017, Iranian medium-range ballistic missiles and drones were launched at Riyadh and the economic hub of Yanbu. Recently, they targeted Jeddah on November 23. In the north, Iran launched drones and cruise missiles into the kingdom twice in 2019, from Iraq and from the kingdom's territory, including the main attack on the world's largest oil processing plant at Abqaiq.

The Proliferation of Missiles in The Middle East

The highest proliferation of guided and unguided missiles in the world is in the Middle East; virtually every country in this region has sought to deploy ballistic missiles at some point in its history. Indeed, a number of non-governmental organizations in the region own the majority of the missiles. For example, Hezbollah and Hamas assert that they have more missiles than the Western governments combined. This current buildup of missiles can be explained by the need to compensate for the relative weakness of the Air Force in the Middle East. Iran and Syria are the two

main countries that possess the largest missile power in the region. The main target of these missiles is Israel, and other Gulf states (such as Saudi Arabia and the United Arab Emirates) are at risk of missile attacks from Iran and Syria. With the increase in the number of missiles and their use in the conflict, regional rivalries will ignite and conflicts in the Middle East will intensify.

Ballistic Missile Classification

There is no internationally recognized classification of missiles. For the sake of simplicity, ballistic missiles can be classified into four categories: short-range missiles with a range of 1,000 km, medium-range missiles between 1,000 and 3,000 km, long-range missiles between 3,000 and 5,500 km, and ICBMs with a range of more than 5,500 km. Currently, there are only three countries in the region, Israel, Iran and Turkey, that possess the technical and industrial capabilities to develop medium-range missiles. According to media reports, Israel already has the Jericho-2 medium-range missile and possibly the long-range Jericho-3 missile, which is believed to be locally manufactured. Iran is actively developing the Sejil-2 missile, which has a range of 2,000 kilometers, and the experience and knowledge gained in developing this missile provide the means to build long-range missiles in the future. Turkey can build the capacity to break into this field if it invests the right money and time. Egypt, Iraq and Syria have in the past pursued programs to develop short-range ballistic missiles. However, there are no indications that among them is a country seeking to develop far-reaching systems in the foreseeable future. Saudi Arabia imported medium-range missiles from China in 1988, the DF-3 systems.

The most important missile systems in the region

<i>Access period</i>	<i>Producer country</i>	<i>Approximate (range (km</i>	<i>Designation of the missile</i>	<i>Type of the missile</i>	<i>Country</i>
2010–2019	Russia	400–300	Alexander	Ballistic	Algeria
2010–2019	USA	300	ATACMST-2K	Ballistic	Bahrain
1980–1989	North Korea	300	Scud-B	Ballistic	Egypt

(Continued)

The most important missile systems in the region

<i>Access period</i>	<i>Producer country</i>	<i>Approximate (range (km</i>	<i>Designation of the missile</i>	<i>Type of the missile</i>	<i>Country</i>
	France	250	SCALP/Storm Shadow	Fired from the air	
2010–2019	Iran	300	Fatih 313	Ballistic	Iran
2010–2019	Iran	500–300	Fatih Mobin		
1980–1989	Iran	500–300	Meteor-1 and Meteor-2		
2010–2019	Iran	700	Rise		
2000–2009	Iran/ North Korea	100–800	Meteor-3		
2010–2019	Iran	700	Zulfiqar		
2000–2009	Iran	1000	(Dezful)		
	Iran	1600	Saucepan		
	Iran	1600	(Emad)		
	Iran	2000	(Sijil-2)		
	Iran/ North Korea	2000	(Khorramshahr)		
–2020	Iran	1400	Martyr Hajj Qassem		
	Iran	2000	(Niche)	Cruz Launched from the roof	
2019–2010	Iran	700	Ali		
	Iran	3000–2000	(Sumar)		
	Iran	1300	Hoveizeh		
–2020	Iran	1000	Martyr Abu-Mahdi		
1999–1990	Israel	1800–1500	Jericho-2 (nuclear warhead)	Ballistic	Israel
2019–2010	Israel	4000More Than	Jericho-3 (nuclear warhead)		
2019–2010	Israel	300	Predator Hawk		
2019–2010	Israel	300	Lura		
1999–1990	Israel	250	Delailah	Fired from air	
–2020	Israel	250	Rampage		
2009–2000	Israel	1000	Harop Loitering Muniton	Cruz launched from the roof	

(Continued)

The most important missile systems in the region

<i>Access period</i>	<i>Producer country</i>	<i>Approximate (range (km</i>	<i>Designation of the missile</i>	<i>Type of the missile</i>	<i>Country</i>
	Italy	250	SCALP/Storm Shadow	Fired from Air	Kuwait
2019–2010	China	300	BP–12A	Ballistic	Qatar
–2020	France	250	SCALP/Storm Shadow	Fired from air	
1989–1980	China	2600–2200	DF–3	Ballistic	KSA
	Ukraine	280	Hrim–2		
2019–2010	USA	250	SLAM–ER	Fired from air	
2010–2000	United Kingdom	250	SCALP/Storm Shadow		
2019–2010	Turkey	280	Pura	Ballistic	Turkey
	Turkey	More than 280	Pura–2		
2009–2000	USA	250	SLAM–ER	Fired from air	
	Turkey	1000	Gezgin	Cruise launched from submarines	
2019–2010	USA	300	ATACMST–2K	Ballistic	UAE
2010–2000	France	250	Black Shaheen	Fired from air	

The proliferation of missiles raises many concerns that they could be used to carry nuclear warheads, and conventional missiles are seen as a growing threat to international stability. However, there is no international treaty to regulate missiles. As for the UN arms embargo or binding restrictions on missile users, they have been applied to countries like Iran. The proliferation of missiles in the region is linked to the role of external forces; France provided the technology for the first Israeli missile program; which led to the deployment of the Jericho missile in the early seventies. Egypt, Iraq, and Libya have also pursued domestic missile programs that rely on technology from Europe. However, most countries in the region tended to import missiles; therefore, it is available in the international arms market. The Soviet Union and North Korea in the 1970s and 1980s supplied several countries in the Middle East and North Africa with Scud short-range ballistic missiles. The use of Scud missiles

played an important role in the Iran–Iraq war of 1980–1988; this prompted Iran to develop missiles, and the 1991 Scud attacks in Iraq against Israel and Saudi Arabia were a major factor behind their investment in missile defenses. With the conviction of the effectiveness of guided missiles in modern warfare, regional demand for similar weapons escalated. The intervention in Iraq in 2003 and in Libya in 2011 served as a warning to the countries of the region, which believed that they might be exposed to similar wars in the future, under the pretext of regime change, and that they must possess strong deterrent capabilities against this concern.

Rocket arsenals

■ *Iran:*

With the impossibility and difficulty of obtaining foreign weapons, Iran decided to rely on the missiles that it produces locally as an essential component of its military arsenal. Iran's arsenal consists mainly of ballistic missiles with a range of 2,000 km. It claims that it does not need longer-range missiles, and its tests in recent years have focused on improving accuracy and maneuverability rather than range. However, Western countries fear that Iran will be able to develop nuclear-armed intercontinental ballistic missiles, based on the technology of satellite launch vehicles. Iran used short-range ballistic missiles in retaliatory attacks against the Islamic State in 2017, and against US forces in Iraq in January 2020. Iran has also reportedly supplied Hezbollah in Lebanon and Houthi rebels in Yemen with missiles or related technologies. Iran has been accused of carrying out the September 2019 drone and cruise missile attacks on Saudi oil facilities.

The technological basis for the development of Iranian cruise missiles was laid in the 1990s when the country launched a project to produce AShM anti-ship missiles. In 1993, China began delivering C-802 anti-ship missiles to Iran, then stopped in 1997. Iran decided to establish a domestic production line for anti-ship and cruise missiles, and received significant Chinese assistance, including technology transfer and training of Iranian engineers.

After the creation of the C-802 production line in the 1990s, the 2000s marked Iran's first efforts to develop a LACM ground attack cruise missile, and the use of reverse engineering. In 2012, it was announced in Iran that it would soon unveil the "Mishkat" cruise missile, which may have a range of more than 2,000 kilometers, and can be launched from air, sea or land platforms. At a domestic defense fair in 2014, the Iranian Aerospace Indus-

tries Organization (AIO) displayed what it called the “Tolu 14”. In 2015, Iran unveiled the Soumar land-attack cruise missile. In 2019, Iran unveiled the Hoveyzeh missile, which has a range of 1,350 kilometers and can reach Israel from western Iran. In 2020, Iran unveiled another missile version of the Soumar family, a land-based anti-ship missile called “Tala’i” or “Shahid Abu Mahdi”, with a range of more than 1,000 kilometers.

Ya-Ali: While Iran was working on reverse engineering the Kh-55 missile, the first fully indigenously designed cruise missile was the “Ya-Ali” missile, which has a range of 700 kilometers and was shown in 2014 at an exhibition. Tehran appears to be maintaining much greater secrecy regarding some of its cruise missile designs. It appears that at least one type of cruise missiles has been successfully developed without being shown to the public, known as “Quds”.

Supersonic cruise missiles: While the focus in Iran so far has been on subsonic cruise missiles, there are also signs of interest in supersonic systems; since 2016, the defence minister has indicated that Iran will soon build hypersonic anti-ship missiles. It is clear that Iran has taken steps towards developing such capabilities.

Mubin: Iran revealed another cruise missile project called “Mubin” during the 2019 air show in Moscow with a range of 450 km, a speed of 900 km/h, and a payload of 120 kg, and some sources indicated that “Mubin” will already be operated with what appears to be the Iranian standard engine for cruise missiles inhaled air.

Quds: Dubbed “Al-Quds” by Yemen’s Houthi rebels, the missiles are perhaps the most mysterious design of Iran’s land-attack cruise missile. The missile was first shown by the Houthis at an exhibition of missiles and drones in Yemen in July 2019, while the group claimed that it developed the missile locally, and the available information strongly indicates that the source of the missile is Iranian.

▪ **Israel:**

Israel is the only country in the region that possesses nuclear-armed missiles, from the Jericho series of ballistic missiles, with an estimated range between 1,500 and 4,000 km. The Arab states and Iran have not stopped calling for the establishment of a region in the Middle East free of nuclear weapons and other weapons of mass destruction, including their means of delivery. Israel’s conventional long-range strike force re-

lies on aircraft equipped with domestically produced, air-launched cruise missiles. Israel also possesses various types of missiles, such as short-range ballistic guided missiles. It was reported that Israel used indigenous Delilah and Rampage guided missiles to attack Iranian targets in Syria in 2018 and 2019.

Gabriel anti-ship missile: Israel began developing the short-running Gabriel series in the 1960s. In the 1980s, it developed the propulsion system for the Gabriel Mk 4 missile, followed by another development, the Gabriel Mk 5, and it became capable of hitting land targets in addition to its anti-ship role, and its range was said to be much more than 200 km.

Delilah missile: It is an air-launched, infrared-guided system with a range of at least 250 km, a hybrid between a short-range cruise missile and idling munitions. Delilah can be programmed to loiter over certain areas, with a data link providing the ability to re-orient to a target or attack a new target. The development of the Delilah included the possibility of launching it from helicopters, from land bases and from ships. Delilah was used during Israel's 2006 war against Hezbollah, and the Israeli air campaign in Syria relied on spare munitions, including Delilah. And in 2018, Israel announced that the missile system was destroying the Russian-made Pantsir short-range air defence system in Syria.

The Israeli company Rafael has developed a group of sliding bombs, including the Spice 250, with a range of 100 km, equipped with advanced navigation devices to follow the Earth terrain, as in cruise missiles, automatic target recognition systems, as well as types of munitions. In 2021, the company introduced the upgraded component Spice 250-ER with an extended range of 150 km.

In the 1980s, it was a heavy, television-guided, air-launched missile powered by a solid-fuel rocket engine. In 2002, the Popeye Turbo, a land-based, jet-powered cruise missile with folding wings and a range of at least 300 km, entered service according to a 2013 report. Many analysts have speculated that the missile may form the basis of Israel's submarine-launched nuclear deterrent.

As for strategic submarine-launched cruise missiles, information is available about Israel's program to convert German-made Dolphin class submarines into nuclear cruise missile platforms, thus providing Israel with a second strike capability. Today, a total of five submarines oper-

ate in the Israeli Navy, and a German-Israeli memorandum of understanding was signed in 2017 to purchase three more submarines to replace older models. German media reported that the Israeli dolphins are equipped with standard torpedo tubes with a diameter of 533mm, and four non-standard tubes with a diameter of 650 mm have been added to them, and many observers associate them with the possibility of launching a cruise missile or modifying American-made systems for use on board their submarines. The Harpoon-based nuclear-armed LACM cruise missiles will be capable of being fired from standard 533mm torpedo tubes, including those installed on Galclass submarines that preceded the Israeli Navy's current Dolphin-class ships. However, the usefulness of such a modification would be greatly diminished due to the limited range of Harpoon. The Popeye Turbo missile is most closely related to the Israeli submarine-launched deterrent, but there are technical problems with launching it from Israeli Dolphin-class submarines; the Popeye Turbo missile has a range of "300+"km, which would not be enough to constitute a credible nuclear offensive capability against Israel's main enemy (Iran). It would require missiles with a range of at least 1,500 kilometres, to be able to target Tehran from the eastern Mediterranean. The possibility of foreign purchase or domestic development shrouded in secrecy cannot be ruled out. It appears that Israel succeeded in its efforts to develop a long-range submarine-launched cruise missile with a conventional warhead. In 2000, the British Sunday Times reported that, according to unnamed Israeli officials, Tel Aviv had tested a cruise missile with a range of 1,500 km in the Indian Ocean. It should be noted that more than two decades passed since the introduction of the Dolphin class submarine and the reported cruise missile test in the Indian Ocean. Taking into account technological advances in other Israeli missile programs, it is very likely that the system originally used by submarines has been since then modernized.

▪ *Saudi Arabia*

Saudi Arabia has a small arsenal of DF-3 ballistic missiles with a range of 2,200–2600 km, supplied by China in 1987, and the purchase of more advanced DF-21 ballistic missiles was not confirmed in 2007. A ballistic missile production line was ordered from Ukraine in 2016 and is under construction in Saudi Arabia.

In 2010, the Royal Saudi Air Force obtained from the United Kingdom about 350 Storm Shadow missiles, which were used in the air campaign in Yemen that began in 2015. Riyadh has also ordered 650 American SLAM-ER cruise missiles to equip its recently purchased F-15SA fighter-bombers, but there is a possibility that the United States will stop exporting air-to-surface offensive weapons. Saudi Arabia is currently making serious efforts to develop the arms industry to an advanced level, with the ambitious goal of spending 50 percent of its military budget on locally produced equipment by 2030. It is not known if the production will include cruise missiles, but the kingdom has revealed its efforts to locally produce a small jet engine as well as a miniature turbofan that can be used to power cruise missiles.

The King Abdul-Aziz City for Science and Technology (KACST) has officially announced other developments in the engines. In 2019, its officials unveiled the TKF-500, a 5.35-kN miniature turbine engine jointly developed and produced by the Brazilian engineering company Turbomachine, stating that light aircraft, drones and guided missiles are potential applications of the TKF-500 engine, which will be explored in cooperation with the Brazilian company Turbomachine, and it appears that the collaboration will focus in particular on cruise missile technology.

■ *Turkey*

In 2006, Turkey began developing its first cruise missile project, the SOM (Stand-Off Missile) air-launched missile. Its first flight test was in 2011, and the Turkish Air Force received it in 2015. It relies on the Inertial Navigation System (INS) and the cosmic system, GPS positioning and terrain tracking. More recent developments in SOM B-1 and SOM B-2 have included improvements in infrared guidance, image-based navigation, and the ability to automatically aim at a target. The SOM-C includes a data link and the ability to target naval ships, and it can carry a conventional or dual warhead with a range of more than 250km, and may have been used in Syria or Iraq. Turkey aspires to increase the range to more than 300 km.

Strategic cruise missile: The first signs that Turkey has ambitions beyond its short-range and ballistic missile programs have emerged. It is clear that the Gezgin missile will have a range of about 1,000 km, and its base will be in the sea, with the possibility of incorporating it into some of the new Turkish frigates and submarines. The question remains

about Turkey's declared interest in long-range cruise missiles, whether they can serve as nuclear warhead systems or as elements of a nuclear hedging strategy in the future. Turkey acquired SLAM-ER ALCMs from the USA. Building on Chinese technology, Bora SRBMs are indigenously developed. Turkey is also studying the development of long-range ballistic missiles and is developing a cruise missile.

▪ *UAE*

The United Arab Emirates has acquired the first air-launched cruise missile to equip its Mirage 2000 aircraft, the Black Shaheen. The UAE was not satisfied with just purchasing ground attack-ready missile systems in 2013, and signed a cooperation agreement with Serbia to develop the ALAS missile, a missile that can hit ground targets with a range of up to 25 km, and the upgraded ALAS-C missile can also hit sea targets. It remains unclear whether the missile has entered service with the UAE armed forces. The UAE appears intent on transitioning from being a major arms importer, with a limited defensive industrial base, to becoming a producer of advanced weapons. At the International Defence Exhibition (IDEX) 2021, the country unveiled a number of indigenously developed weapons systems. The UAE HALCON Systems showcased the HAS-250, a land-based anti-ship missile with a range of 250 km that can also be used against coastal targets that emit radar signals. Jet-propelled loitering munitions were also shown, namely Shadow 25 with a payload of 25kg, and Shadow 50 with a payload of 50kg, both of which are capable of hitting targets at a range of up to 250km. Halcon also displayed the NASEF-S120 explosive cruise missile, which is capable of attacking targets with a range of 90km when launched from the ground and 120km when launched from the air, and is equipped with satellite navigation systems and a laser seeker.

Most of the systems seem to be equipped with small motors that may have been designed and manufactured locally, or with foreign expertise. However, the design and production of upgraded engines and other components demonstrate the seriousness of the Emiratis' ambitions to establish indigenous capabilities to develop and produce precision-guided munitions and drones. The UAE has benefited from official cooperation with foreign defence agencies, especially with regard to the transfer of foreign expertise and technology. Cooperation with South Africa has been particularly notable, and has benefited the UAE's burgeoning defence industrial base in a lot of different ways. In 2013, a joint venture

was established between the UAE and South Africa to produce locally designed glide bombs. UAE may also be working on other cruise missile programs, which are in the very early stages of development or are under tight control. And if UAE decides to work on more ambitious longer-range cruise missile projects, it may once again benefit from its association with South Africa. The UAE has acquired a large arsenal of Black Shaheen ALCMs from France and ATACMS T 2K SRBMs from the USA. Although there is no evidence that these types of missiles were used in the Saudi-led military operation in Yemen, the UAE has reportedly used shorter-range ALCM missiles against the Houthis.

▪ *Egypt*

Egypt is one of the first developing countries that sought to develop ballistic missile capabilities. It has a limited arsenal of ballistic, cruise and air defense missiles. The arsenal of ballistic missiles in Egypt consists of short-range missiles. This reflects the regional nature of its threat perceptions. They include the Scud, the Luna-M, and the Saqr 80.

The Scud B missile has a range of 275-500 km, and is guided by inertia, and Egypt has the basic ability to produce it. The Luna missile was developed jointly with North Korea, and it is a Soviet missile with a range of 450 km. In July 2012, the Obama administration approved the sale to Egypt of 20 Harpoon anti-ship cruise missiles, an anti-ship missile with a range of 125 km and a 500 kg warhead. Egypt has one of the largest and best organized air defense systems in the Middle East. Its arsenal includes 12 batteries of improved MIM-23 HAWK surface-to-air missiles with 78 launchers. The Hawk has a range of 45 km to 50 km. In 1999, Egypt acquired 32 Patriot missiles from the United States, a missile designed to defend against short and medium-range ballistic missiles.

▪ *Qatar and Kuwait*

Qatar has ordered 140 missiles for its fleet from the Rafale. Reports stated that the Typhoon fighter jets requested by Kuwait could be armed with the British Storm Shadow missile. The recent expansion of the Qatari Armed Forces has included the purchase of advanced combat aircraft equipped with SCALP/Storm Shadow ALCMs from France and BP-12A SRBMs from China.

▪ *Yemen (the Houthis)*

Since the beginning of the Saudi-led intervention in Yemen in 2015, the Iranian-backed Houthi militia has launched a massive missile campaign and launched drone strikes against targets inside Yemen, Saudi Arabia, and the United Arab Emirates. More successful combat operations were launched using the Quds missile. It is very likely that it is of Iranian origin. Al-Quds missile was used in an attack on Abha airport and an Aramco site in the Saudi city of Jeddah, in addition to the Al-Quds attacks on Shaeq, Yanbu and Riyadh, and again on Jeddah. The largest confirmed attack occurred on September 14, 2019, in a major coordinated strike against Saudi Aramco facilities located in Abqaiq and Khurais. The UN Panel of Experts concluded that the attack did not originate from Yemen, and speculated that the attack was launched from either Iran or Iraq. The attack demonstrated the combat value and disruptive potential of simple loitering munitions and counter-attack landmines when used against vulnerable critical infrastructure. The status of Yemen's missile arsenals, which mostly consist of short-range ballistic missiles, is uncertain due to the civil wars taking place there.

▪ *Algeria*

Algeria is among the few countries in the Middle East and North Africa to possess submarine-launched cruise missiles (SLCMs). Four of the six Russian-made Kilo-class submarines are equipped with the 3M14E Kalibr (RS-SS-30B) SLCM submarines and some of their types can be used against sea and land targets. In 2008–2009, the country also received from Russia air-launched KH-59 (RS-AS-18 Kazoo) cruise missiles. Algeria received short-range Islander missiles from Russia in 2017. It was reported that Algeria used Kalibr missiles to attack land targets during a military exercise in 2019.

▪ *Syria*

In 2009, Syria purchased from Russia the 3K55 Bastion (RS-SSC-5 Stooze) coastal defense system, which uses the supersonic 3M55 missile and is capable of hitting targets up to 300 km away. In 2013, fearing that the missiles would be transferred to Hezbollah in Lebanon, Israel launched air strikes against various sites believed to be their positions. The status of Syria's missile arsenals, which mostly consist of short-range ballistic missiles, is uncertain due to the civil wars taking place there.

▪ *Iraq*

In the 1990s, Iraq began several projects to convert anti-ship ballistic missiles into land attack cruise missiles, including the Jenin program, which aims to convert a Chinese-made HY-2 missile into a cruise missile with a range of 1,000 km. However, not much progress was made on the project prior to the US invasion of the country. During the 2003 campaign, Iraq fired a total of five slightly modified HY-2 missiles at ground targets in Kuwait. Although none of them were intercepted, all failed to hit their targets. The remaining missile arsenal in Iraq was dismantled in 2003.

▪ *Libya*

In the same year, 2003, Libya abandoned its previous nuclear and missile programs in agreement with Western powers.

Missile defences

Israel and most of the Arab states in the Gulf have invested heavily in missile defence systems based on surface-to-air missile systems (SAMs), to counter actual or potential threats from non-state actors and Iran. Ironically, this has contributed to Iranian efforts to develop missiles that can penetrate such defences, particularly through greater manoeuvrability.

Israel's multi-layered defences include locally produced SAM systems, such as the Iron Dome, as well as the Arrow system, which was developed in cooperation with the United States of America. The missile defences provided by Saudi Arabia consist mainly of the Patriot Advanced Capabilities Advanced PAC 3 SAM systems, which can be used against aircraft, cruise and ballistic missiles, and it has ordered the THAAD system, an anti-ballistic missile system. The efficiency of current PAC-3 defences in Saudi Arabia has been called into question. The systems have failed to intercept many of the missiles launched by the Houthis since 2017. Qatar also owns PAC 3s. Bahrain ordered PAC 3s from the US in 2019, and Turkey purchased the S 400 system from Russia.

Countering regional missile threats

Missiles have been used with increasing frequency in recent years, and a more comprehensive approach is needed to confront the complex missile threats in the region. The long-term goal should be cooperation to control weapons, including missiles and other military capabilities. Despite the existence of international standards that impose strict restrictions on the export of ballistic and cruise missiles with a range of 300 km or more, and a payload of 500 kg or more, as being capable of making weapons of mass destruction; export operations will not stop.

Ship Missiles Equipped With Coastal Land Attack Capabilities

In addition to cruise missiles intended for land attack, the Middle East has also seen the proliferation of anti-ship missiles that have a secondary role in land attack. The US-made Harpoon Block II missile is used to attack land targets at a range of up to 124 km, or 248 km in the case of the long-range model. The missile was exported to Morocco, Saudi Arabia and Turkey as requested by Qatar. Egypt currently has Harpoon Block II missiles aboard the Ambassador IV fast-missile carrier, but according to SIPRI the ground attack capability of the missiles has been cancelled under pressure from Israel. Egypt also has a range of Harpoon Block II submarine-launched missiles, although it is still unknown if they have the capability to launch a land attack; European defence companies have also found markets for anti-ship missile systems in the Middle East. The Exocet MM40 Block 3 missiles have been delivered to Egypt, Morocco, Oman, Qatar and the UAE and are capable of carrying out land attack missions with a range of up to 200 km. In addition, the Swedish RBS-15 MK3 missile, which has a range of more than 200 km and can be employed for ground attack, has been exported to Algeria.

In 2021, the Israeli company Rafael unveiled a new missile system with a range of 300 km called the Sea Breaker that can be used as a land-attack or anti-ship missile. According to Rafael, the Sea Breaker can be launched from either land or sea, is capable of operating in areas rejected by Global Navigation Satellite Systems (GNSS), and has an automated target recognition system. In addition, Turkey's home-developed

ATMACA anti-ship missile, with a range of more than 220 km, is also capable of attacking coastal targets according to some reports.

Conclusion

The past years have seen a steady increase in the use of missiles in the region, which calls for measures in the region to confront the complex threats associated with this type of weapons. These include increasing transparency through relevant multilateral mechanisms, clarifying international standards on missiles and exacerbating existing military disparities in the region, strengthening conflict management efforts and restoring the Iran nuclear deal, and engaging in confidence- and security-building measures to manage risks and address the root causes of the military race.

Missile Defense System Issues in the Middle East

2

AHMED ELIEBA*

In general, it can be argued that the absence of missile armament controls in the Middle East is the main characteristic of the outcomes of indicators which in turn indicate a failure in the missile force equation. In recent decades, most countries in the region turned to increasing their stockpile of missiles and enhancing their capabilities. On the other hand, in light of the increasing number of conflicts and tensions among many regions' actors, or between them and other parties, the use and deployment of missiles in the Middle East revealed that there is a defense exposure. Under international Indexes, the Middle East is the most region using missiles around the world, with up to 90% of the total use of missiles in the world.

Global estimates emphasize that the most serious challenge in the Middle East is Iran's expansion, whether by enhancing the Iranian missile capabilities, or by the uses and deployment through its non-state allies and proxies in Lebanon, Iraq, and Yemen, especially in light of the US orientation to contain Iran's missile program within reviving of the Joint Comprehensive Plan of Action (JCPOA) by the P5+1 (China, France, Germany, Russia, the United Kingdom, and the United States.)

*CHIEF OF ARMAMENTS UNIT AT THE EGYPTIAN CENTER
FOR STRATEGIC STUDIES (ECSS)

In turn, these estimates are mainly concerned that the counterparties of Iran tend to boost their defensive capabilities to address the Iranian threat, whether in the Gulf or with respect to Israel, or even Turkey, which is sometimes referred to in this context.

However, in practice, the situation of the “missile arms race” in the region cannot be reduced as such. These aspects may be currently associated with the ongoing interactions in the conflict areas, along with Iran’s tendency to grow and enhance its missile capabilities to leverage over more than one party. Also, it can be argued that Iran poses a threat to regional security, by exploiting its missile capabilities – specifically – in return for the decline of its air force capabilities in terms of combat jets. However, this situation does not mean necessarily that there are no other regional parties that always seek to gain missile capabilities for other purposes. For example, it seems that Iran primarily uses missiles to deter the Kurds.

There is another issue that relates to the situation of the missile arms control process. Despite that the missile races arose out earlier in the region, with what was called the “War of the Cities” during the Iran-Iraq war, the political settlements of the war, however, did not drive to controls on missile armament, as no regional experience was shaped to control the armament process. During the ongoing conflict in Yemen, there was a tendency to subject the missile capabilities to the settlement agreement, in its security aspect, making Houthi rebels give up their heavy weapons and handover them to a neutral party. This was provided for in the initiative of the former US Secretary of State “John Kerry” in 2016. However, this context was not brought up again. Nonetheless, the regional parties have witnessed no experience which is similar to the international experiences of arms controls during the Cold War.

Presumably, there may be an implication of the international chaos in the process of curbing missile armaments on the regional situation. Indeed, in 2021, the United States and Russian Federation have agreed on a five-year extension of the New Strategic Arms Reduction Treaty (New START). However, before this agreement, the Trump administration previously showed unwillingness to renew the treaty, based on endeavors to bring China into the agreement. Nevertheless, these endeavors failed. In this context, we can quote the statements about the American motives for intervening China into the agreement, particularly, the «silent armament» of missile capabilities by China towards Russia and vice versa. In the Mid-

dle East, there is a case similar to this context, where many regional powers do not disclose the support of China and Russia for their missile arsenals. As for the case in Iran, for example, it can be argued that Iran mainly relied on China to build its missile arsenal, in addition to Russia, which was a main provider of the Iraqi missile armament during the Iran-Iraq war. Later then, Russia became the main source of Iranian armament, and some reports refer to North Korean role in this process.

In this regard, one could attest that there is a lack of transparency about many regional powers arming for missile armament sources, in addition to the significant development of these capabilities as to be used in different forms. For example, surface-to-air missiles can be turned into surface-to-surface missiles, as the case in the Chinese C-802 missile, being used in attacking the Emirati ship (Swift) of the coalition, which was modified by the Houthi militia. This modification also includes the missile head, and, sometimes, the missile's tail is upgraded, to accommodate the required targets.

There are several reasons for defensive exposure. These reasons can be referred to in this context, the most prominent ones are five essential dimensions, namely:

1. Structural Dimension:

This dimension relates to the capability of armies to keep pace with the increasing usage of missiles in conflicts and disputes, that it is difficult, under density and multiplicity of missile launch fronts, to deal with the huge numbers of missiles. This is the case in both Saudi Arabia and the legitimate areas in Yemen, which are continuously exposed to missile attacks from the Houthi militia in Yemen. At the same time, as Yemen enters its eighth year of conflict, it hits the time average of the longest regional war by using missiles in the region after the first Gulf War, embodying the first definition of "The War of Cities". This war witnessed the launching of about 600 missiles on both sides. This is the case in Israel, with the outbreak of battles with the Palestinian factions or the Lebanese «Hezbollah», in addition to the missile capabilities of the Iraqi militias that were exploited against the US military presence in Iraq.

2. Political Dimension:

This dimension comes in light of the inability of certain countries to obtain defense systems given the armament restrictions thereon, as in Iran and Turkey. For Iran, the sanctions imposed on Iranian armament gener-

ally hindered Iran from obtaining advanced weapons, excluding the short period of the implementation of JCPOA (P5+1) in 2015. Within this short period, Iran obtained the Russian S-300 system under a contract made in 2007. Most likely, this system entered service in 2017. Though, Iran has been alleging that it had to manufacture local systems such as “Khordad” and Bavar-373, during that period. Hence, it is believed that Iran deploys these systems in the vicinity of its nuclear facilities¹. Therefore, it remained in need of obtaining more of these systems for further defensive coverage, in general. This case is not different from the Turkish case; as wars in the Gulf region have been the reason for Ankara’s pursuit of missile defense systems from the United States. However, Washington has been continually neglecting the Turkish demand to purchase the Patriot missile defense system. Therefore, Turkey turned into the Russian alternative; i.e. (S-400), and was reluctant to obtain alternative systems from NATO. Although Turkey obtained this system, Ankara announced that it was going to buy more of that system from Russia, confirming a Turkish’ defense coverage gap².

3. Capability Dimension:

Of course, the experience witnessed by the region in the wake of the “Arab Spring” revealed missile defense gaps, and deficiencies in the capability to confront different types of missiles, in particular, short-range missiles used by militias and armed factions in conflict areas. Russia, for example, had to deploy its systems in Syria, such as the Buk-M2A, Tor-M2, Pantsir-S1, Pechora-M2 systems. Also, the UAE obtained the Russian Pantsir-S1 system, with a tendency to upgrade the system under cooperation between both parties³. In this connection, reference can be made to the absence of specific types of defense systems, such as naval systems. During the Yemeni war, for example, about three coalition naval vessels were subjected to missile strikes causing them to be out of service.

4. The Changing Military Balance in The Middle East:

With the US moving to mobilize its military forces under its Shifting-to-East policy, Washington demobilized many defense systems from Iraq, Syria, and the Gulf, to redeploy them in the South China Sea⁴, forming a significant defense gap in these regions. In particular, the Gulf countries seeking strategic alternatives for these systems, some systems were leased for a specific period for addressing the issue on the Yemeni front. In this

context, the US may consider that limiting its presence in Iraq and Syria may reduce pressure on the need for these systems. However, it is presumed that Iran will, as a threat, constantly recourse to maintaining a huge stock-pile of missiles in Iraq, whether against the US limited presence or even against US allies in the region starting from Iraq, and particularly, Israel.

5. The appearance and widespread employment of new offensive systems:

such as unmanned combat aerial vehicles (combat drones), as the drone attack on Saudi Aramco's oil processing facilities more than once by the Houthi militias, with Iranian support. US estimates confirm that the Iraqi militias, or the Iranian Revolutionary Guards, may launched these combat drones to attack «Aramco» from Iraq territory, not from Yemen⁵, in mid-2019. However, later, the Houthi militia followed the same method by attacking the internal conflict fronts for countering the Government forces and joint forces. This context reaffirms the emergence of indications of Iran's use of missile-loaded aircraft in the oil tanker war between Iran and Israel during 2021.

New Approaches:

As previously stated, there is no regional tendency towards the process of arms control in general and missile control in particular. However, there are many problems in this context, including the impossibility to bet on regional powers at the present point in light of regional tensions, and endeavors of many powers towards regional expansion. This comes in addition to challenges of controlling militias, armed factions, or non-state actors in the region that possess these missile capabilities. On the other hand, there are new tendencies to address this situation, under several approaches, including, but not limited to:

De-escalation:

Parties to certain conflicts have tended to adopt de-escalation policies as an attempt to reduce security engagement in conflicts in general and reduce missile attacks in particular. One of the most notable examples is the case of the Syrian conflict, where Russia established de-escalation zones that significantly contributed to arranging the security situation in

Syria. However, Moscow has been repeatedly confronting Tel Aviv's missile strikes on Syria, driven by targeting Iranian missile transfers to there. There are conflicting signs in this regard. As in the aftermath of the Russian-Israeli talks between Russian President Vladimir Putin and Israeli Prime Minister Naftali Bennett in Sochi (October 2021), it was reported that Russia sought to push Israel to back off the missile attacks launched on Syria. On the other hand, it was further reported that Israel may have sought to obtain more space to have freedom of action to target Iranian convoys carrying missiles to Syria.

Undermining Motivations:

Under the umbrella of the US-Iraq strategic talks, a joint action plan was reached on the nature of the US military existence in Iraq, being the reason that Iran has always used to justify its proxies attacking US military bases and the US embassy. The agreement provided for reducing military existence to the bare minimum of the Iraqi-American military cooperation, in terms of training and consulting, with ending hostilities. Despite that fact that Iran did not satisfy with this format, and emphasized the need to end the American existence in Iraq in general, however, the missile attacks on military and diplomatic facilities in Iraq significantly decreased after the agreement.

Strengthening Missile Defense Capabilities:

It can be argued that the previous two orientations are closer to being political understandings and tactics. However, neither of them will drive to limiting behavior of parties to the conflict, or, in parallel, it is expected to tend setback missile arms races. Also, it can be considered that the equation of engagement and the nature of the political situation are essential determinants. Iran places the US as a confrontation priority in Iraq. Therefore, the de-escalation or decline in attacks is associated with the decline of the US military presence in the region. However, in Yemen, the Saudi-Iranian talks did not result in the mitigation of the conflict led by Iran by proxy through the Houthi militia in Yemen. Neither of them addresses the root causes of the problem, the possession of capabilities and uncontrolled use. Therefore, there is an escalating trend to boost and improve defensive capabilities that can be affirmed by more than one indicator, including, but not limited to:

Establishing a Defense Umbrella against Iranian Missiles:

This represents the direction that the United States is motivating the Gulf countries and Israel to establish. In this regard, we refer to the «Manhattan Project»⁶ as an American project to develop an Israeli-Gulf defense system, seeking to apply the Israeli-Gulf normalization agreements to the military aspect, given addressing the Iranian threat. The Project aims at transforming the military expenditure increase into missile capability enhancement of the Gulf countries against Iran in the context of the arms race process or reaching deterrence balance. Also, the defense expenditure and participation in improving capabilities of the Gulf countries can be enhanced by making use of the available US systems along with the Israeli capabilities; i.e. the «Iron Dome».

It can be said that Saudi Arabia has not yet been involved in this path. It may be seeking to find different alternatives, particularly, as many estimates are indicating the concern of Riyadh is due to the setback of the American support to it in the war on Yemen, for example. These concerns have increased as a result of the withdrawal of the missile defense systems, triggering a defensive gap for the interest of the Houthi militia. Furthermore, there are concerns about missile munitions, with which the US is presumed to support seven systems (THADD) that Riyadh is supposed to receive starting in 2023. Meanwhile, Saudi Arabia compares this American approach with that of Russia, which supports the defensive systems of Iran, and - simultaneously - supports Turkey with missile defense systems with very flexible terms, including the payment process, as well as manufacturing partnerships, in particular, ammunition.

The visit of Prince Khalid bin Salman, Deputy Minister of Defense of Saudi Arabia, to Russia in August 2021 is seen as an exploratory visit for military cooperation in general. Also, it may target to examine the situation if Saudi Arabia tends to revive relations with Russia⁷, in light of the US ongoing threatening with sanctions under the Countering America's Adversaries through Sanctions Act (CAATSA). It is the US that constantly drives its partners to find alternatives; as it curtails the partners' capabilities to improve their defense situation. Also, the systems provided by the US are so expensive if compared to the Russian systems. We cannot only consider the Turkish case in this regard, as the US imposed sanctions on Turkey for obtaining the S-400 system. However, there is also India,

which turned to the Russian alternative as well. Although Turkey's position seems to be more difficult, for being a member of NATO, and that its relations with Russia may pose a threat; however, Washington has not developed acceptable strategic alternatives for Turkey.

Furthermore, for political considerations, the Russian alternative may be useful, as Russia may be a better mediator between the Gulf countries and Iran than the US. In the case that Russia is the common provider of defense systems to both parties, this may help Russia to be playing a better mediation role between both parties to relieve the situation in conflict areas, especially in Yemen. However, on the other hand, Israel remains another common denominator in the equilibrium equation and the tension equation, in parallel. The US endeavors to strengthen defense ties between Israel and the Gulf countries will raise the Iranian hostility against the Gulf countries. However, passing through Israel may help avoid US sanctions. India, for example, strengthened its military relationship with Israel, while Ankara was back again to open channels of communication with it. This is in addition to Russia itself, which is employing the relationship with Israel in part to calm tension with the US.

A further dimension to be considered is that why did the Gulf countries not recourse to adopting a unified defense system that could be an alternative for concerns or doubts about the defense connection with Israel. This question is often answered that there are differences in the framework of approaches of the Gulf-Iranian relationships, to the extent of approach between some Gulf countries with Iran, including Oman and Qatar. Another indication in relation to the operational factor that always recurs in Western estimates is that the Gulf experience does not allow the proper management and operation of defense systems and that they constantly need external support. However, in fact, it is supposed that this aspect is just propaganda - to a significant extent - more than reality. Also, it may constitute a paradox, as Western estimates indicate Iran's superiority over the Gulf, in terms of offensive and defensive missile capabilities. However, it does not indicate in any event the responsibility of the US for this imbalance, particularly, since these estimates indicate that the "superiority" does not only lean on the human dimension but also in Iran's ability to upgrade missile systems, confirming that American responsibility is far from this connection.

It is important to note that there is a large momentum of observations on the effectiveness of the Israeli “Iron Dome” system, particularly, under the experience of the fourth war between Israel and the Palestinian factions in 2021. The Palestinian factions were able to upgrade their missile capabilities to longer ranges than they were in the past, causing a failure of the system to encounter them. This is in addition to the factor of the missile density used by the factions, which had an impact on re-evaluating the system’s military position. Following the war, an evaluation committee was formed. Also, Israel turned to the US to fill the gap of the need for more support for the system, as there was a shortage of batteries required for comprehensive defense coverage. This context mirrors a result providing that the “Iron Dome” system may not be the model that is preferably reproduced in the Gulf region.

Developing Multi-layered Systems:

In October 2019, Iran announced that it is in the process of launching a multi-layered defense system to address defense challenges resulting from inaugurating a new command base in the Asalouyeh and Khark Island in Bushehr Governorate, by the commander of the «Khatam Al-Anbiyaa» air defense headquarters, Major General Abdul Rahim Mousay. According to the Iranian media, the objective of establishing the base is coined at controlling a vast area, directing the air defense units of the army and the Revolutionary Guards based on the southern coast of the country, and monitoring all air movements in the Gulf airspace using the cutting-edge technologies and equipment. Despite the indications provided by Iran about its objective, motives, and even the elements of the project of building a defense system, all of these dimensions remain shrouded in mystery, namely the conventional behavior that Iran has always pursued.

Therefore, this step confirms that Iran simulates both Russian experiences at the Russian Hmeimim Air Base in Syria, which is surrounded by a comprehensive system under Moscow’s control, as well as Israel, which established a multi-layered system in the same year in cooperation with the US. For Iran, it is evident that Israel’s enhancing of its defensive system comes in light of the spread of Iranian missile warehouses in the region at its proxies in Iraq, Syria and Lebanon, in addition to the growing capability of Iran to technically improve these systems to hit the

targets accurately. Moreover, these systems are most likely to be used by Iran and its proxies against Israel from any of those areas.

This main system incorporated several radar and defensive systems, including radar and air defense of the army and the Revolutionary Guards in Asalouyeh and Khark Island, which are «Matlaa», «Tabas», «Tor-M1», «Tlash», «Mersad» and «Kayhan». However, in this regard, there are many observations, including, but not limited to:

It is not simply believed that these systems, which will be integrated into building the multi-layered system, given that these systems are not the latest or most efficient of the Iranian systems, there are new systems, such as (Power 373) in 2012 and (Khordad 15) system. These systems constitute the recent generation in the local systems, particularly, given that the latter is being relied upon since shooting down the American drone Global Hawk RQ-4 over the Strait of Hormuz, it has not been indicated that it will be incorporated.» Also, the multi-system linkage process efficiency is not yet known, as no maneuvers were conducted to test the system, as the Israeli systems were examined in joint US-Israeli maneuvers.

There is another perception, namely Iran's need to strengthen its defense position in general, while not limiting it to the deployment of the Russian S-300 system. This will reveal Iran's need to deploy many systems for security purposes on the one hand or support on the other. As such, it is not believed that Iran will deploy all Russian batteries in one region for addressing many threats, particularly, as many estimates indicate that Tehran has only acquired four batteries with a limited number of missiles. Therefore, it needs the support of a system using local missiles. This can be affirmed by further indication that is represented in Iran's expansion in the production of "Sayyad" missiles, for example, to supply «Power 373». Also, in this process, it will depend on Russian technology, explaining the dependence on systems similar to that technology, specifically the Russian «Tor-M1» system. Under coverage calculations, it is believed that the S-300 system may be better to cover the Iranian zone in the Gulf, which interferes with the spread of several foreign bases, including the U.S. 5th Fleet Department and the British HMS base in Bahrain. However, it may not be the safest and most quick to react in the event of a multi-directional attack.

Despite the enhancement in the Iranian radar capabilities to be deployed within the framework of the multi-layered defense project, how-

ever, it is also believed that it remains in need to be further developed to monitor some targets in the Gulf if they are used in a counterattack. These include DF-3 missiles in Saudi Arabia. Additionally, whether the US will decide to use the F-22, or whether the US and Israel will use the F-35 system. Nevertheless, the current capabilities or such being developed by Iran make it difficult for the other side to deploy mechanisms that are more capable of maneuvering and concealment. Hence, it bet on placing challenges for the other side.

Eventually, it is believed that there are defects in the missile defense systems in the region. It is also supposed that addressing such defects will not require an increase in the demand for the arms race factor, as much as they need for rational armament policies. This is in addition to improving the transition to political settlements instead of promoting the path of driving the parties to war permanently. Attention should be paid to the widening circle of involvement in the Middle East, which is no longer limited to regional powers only. However, it should be considered that part of this conflict is related to the course of conflict or competition of major powers in the world. Undoubtedly, the US significantly focuses on China's role in supporting Iran militarily and with armament. Accordingly, a part of the conflict with Iran involves the dimension of the relationship with China, which will in turn have repercussions on the Middle East.

Meanwhile, concerns about Iranian missile threats in the region cannot be underestimated in any way. However, the approach of the US by pushing for the inevitability of a relationship with Israel will increase Iranian frustration against the parties turning to military cooperation with Israel. Also, it will not consider this as a tendency to strengthen the defense situation. On the contrary, it considers the issue as a tendency to strengthen the offensive position, in addition to other implications which come in relation to the nature of Arab national security, particularly, in the light of the Palestinian issue, which cannot be excluded from the equation. As Abraham Accords are seen as aiming at promoting peace in the region, at the same time, it should not be necessary to search for strategic alternatives to peace with Iran. In this context, Iran should take the initiative to dispel Arab concerns about Iranian expansion in the region. It is believed that Iran's possession of a nuclear bomb is possible. Of course, this result will increase regional risks and, in turn, drive the

other regional powers to consequences that are more dangerous than the conventional arms race.

The reduction of competitive policies and arms races may require reviewing the American policies towards the region in general. As such, continuing to maintain Israel's military superiority as a strategic principle is no longer accepted by many regional parties. This, in turn, will multiply the tendency of regional powers to search for similar alternatives, by strengthening their relationships with Russia and China. Although the US blames these parties for this approach, they have not provided the US with the appropriate support. Indeed, the US priorities go ahead over the interests of allies without taking into account any repercussions arising out accordingly.

References

1. April Brady, Russia Completes S-300 Delivery to Iran, Arms Control Association, December 2016. Available At <https://www.armscontrol.org/act/2016-11/news-briefs/russia-completes-s-300-delivery-iran>
2. Humeyra Pamuk, Erdogan says Turkey plans to buy more Russian defense systems, Reuters, September 27, 2021. . Available At: <https://www.reuters.com/world/middle-east/turkeys-erdogan-says-intends-buy-another-russian-s-400-defence-system-cbs-news-2021-09-26/>
3. Hatem Hussein AND Rola Al Ghoul, UAE, Russia Effectively Collaborating On Pantsir Missile System: Rostec Chief, WAM, 18-feb 2019. Available At: <http://wam.ae/en/details/1395302740510>
4. Oren Liebermann, Pentagon pulls missile defense, other systems from Saudi Arabia and other Middle East countries, CNN, June 19, 2021. Available At: <https://edition.cnn.com/2021/06/18/politics/pentagon-remove-missile-defense-saudi-arabia-middle-east/index.html>
5. Isabel Coles And Dion Nissenbaum, U.S.: Saudi Pipeline Attacks Originated From Iraq. WSJ, June 28, 2019. Available At: <https://www.wsj.com/articles/u-s-saudi-pipeline-attacks-originated-from-iraq-11561741133>
6. Michael Knights, A Missile Defense “Manhattan Project” in the Middle East, , The Washington Institute, Dec 30, 2020. Available At: <https://www.washingtoninstitute.org/ar/policy-analysis/mshr-w-manhatn-lldfa-alsarwkhy-fy-alshrq-alawst>
7. Robert Mason, Saudi-Russian Military Cooperation: Signaling Or Strategy? The Arab Gulf Statues Institute In Washington, Sep 3. 2021 Available At: <https://agsiw.org/saudi-russian-military-cooperation-signaling-or-strategy/>

Anti-Ship Missiles (AShM)

3

REAR ADMIRAL MAHFOUZ MOHAMED TAHA MARZOUK*

AShMs are guided missiles designed to hit surface ships with high accuracy using an inertial guidance system during the first flight phase and active radar during the terminal phase. Some missiles have a passive homing capability. In 1957, the Soviet Union was the first to produce this weapon for use against surface ships. It was the STYX (SS-N-2) missile – as NATO called it – that was equipped with a radar guidance system that allowed it to hit medium and large-sized ships with high accuracy up to a range of 20 miles (which is approximately the range of the radar horizon). Surface-to-surface missiles can be launched from surface ships (missile-armed boats, corvettes, frigates, destroyers), and air-to-surface missiles can be launched from aircraft (bombers, fighters, maritime patrol aircraft, helicopters). Missiles can also be fired from submarines or coastal batteries. If the range of an anti-ship missile is more than 60 miles (about 110km), it is called an anti-ship cruise missile.

*FORMER DIRECTOR OF THE NAVAL COLLEGE

FORMER VICE CHAIRMAN OF SUEZ CANAL ECONOMIC ZONE AUTHORITY

AShMs in battle

The first use of these missiles in combat was in October 1967, when the Egyptian naval forces sank the Israeli destroyer Eilat inside Egyptian territorial waters off Port Said, using the Russian-designed Komar class missile boat. Anti-ship missiles continued to be used in naval battles afterwards, including during the Indo-Pakistani war of 1971, where the Indian Navy carried out two raids using the same missiles on a Pakistani naval base in Karachi. Major losses included two destroyers, a refueling ship and an ammunition transport ship, nearly a dozen merchant ships, and several smaller ships. They also destroyed major coastal facilities, including fuel storage tanks and offshore installations.

In the October 1973 war, the first battle between missile armed fast patrol boats took place. It was between the Israeli and Syrian missile boats and followed by several battles between the Egyptian and Israeli missile boats. Several losses occurred between the two sides. In 1982 during the Falklands War, anti-ship missiles were used, as an Argentine fighter/bomber launched a French Axocet AM-39 air-to-surface missile on the British destroyer Sheffield and sank it. The same missile was also used against another English destroyer called the Glamorgan and damaged it.

In 1987, the frigate USS Stark was hit and badly damaged by a missile from an Iraqi Mirage F-1 fighter in the Arabian Gulf.

In 2006, the Lebanese Hezbollah damaged the Israeli SAAR 5 (INS Hanit) with a coastal guided missile.

Missile defense systems

All of the aforementioned battles demonstrated the serious threat such missiles pose to warships, especially since these ships had a radar and thermal signature that cannot be hidden, which increases the accuracy of homing missiles. The response was to redesign the ships and to create positive and negative countermeasures to improve anti-missile defense systems.

Active anti-missile defense systems

- Ship borne anti-missile system.
- Electronic Countermeasure System (ECM).
- Radar guided anti-aircraft medium caliber guns.
- A short-range Close in Weapon System (CIWS) with high rate of fire (2,500 to 3,000 rounds per second), such as the Phalanx and the Goalkeeper.
- Electromagnetic decoy system to deceive the radar of the launching unit and the missile's homing radar by using chaffs at different distances.
- An infrared decoy system to deceive the missile's heat-seeking system.

Passive anti-missile defense systems

Ship designers have succeeded in reducing a ship's radar signature using stealth technology. This has decreased the detection range from hostile radar units and missile homing radars. They have also succeeded in reducing ships' infrared signature to decrease the detection range of heat-seeking missiles. Finally, they have also reduced ships' underwater acoustic signature to decrease the detection range of hostile submarine hydrophones.

It is noteworthy that all these systems must be supported by ESM systems, multi-frequency radar systems to detect missiles at sufficient distances, computers to calculate course, speeds and altitudes, and comprehensive systems for early warning, search, reconnaissance, follow-up, and command and control (C4ISR). These systems are essential to enable warships to detect hostile units, whether surface ships, submarines, or aircraft, and destroy them before they launch their missiles, or deceive/destroy the missile itself during its flight phase.

Anti-missile defense for aircraft carriers

The anti-missile defenses for aircraft carriers are organized in layers:

The first layer of antimissile defense in a modern, fully equipped aircraft carrier task force is always the long-range missile-carrying fighter planes of the carrier itself. Several fighters are kept on combat air patrol (CAP) 24 hours a day, seven days a week when at sea, and many

more are put aloft when the situation warrants, such as during wartime or when a threat to the task force is detected.

These fighters patrol up to hundreds of miles away from the aircraft carrier task force and are equipped with excellent airborne radar systems. When spotting an approaching aircraft on a threatening flight profile, it is the responsibility of the CAP to intercept it before any missile is launched. If this cannot be achieved in time, the missiles themselves can be targeted by the fighters's own weapons systems, usually their air-to-air missiles, and/or their rapid-fire cannons.

The second layer should be the accompanying warships using their aforementioned defense systems to destroy any remaining hostile missiles.

Anti-ship ballistic missiles

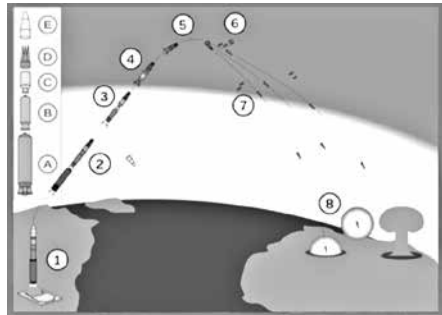
Since the first use of anti-ship homing missiles in combat in 1967, designers have made great efforts to increase the effectiveness of these missiles and their ability to evade the layers of anti-missile defenses. They have increased their speed and range, improved their homing systems, given them the ability to approach the target in sea skimming profile and to climb and dive in the terminal phase.

While these measures improved the survivability of missiles dramatically, their flight inside Earth's atmosphere limits their speed to that of sound and their effective range to no more than a few hundred kilometers. The solution was to use ballistic missiles that can fly outside the atmosphere.

The trajectory of ballistic missiles

The ballistic missile follows a path outside the atmosphere to launch one warhead and a number of decoys. The missile is fired from the launcher after igniting the thrust engine at point A in the adjacent figure.

At point 2 (same figure), the first stage falls and the second



stage is activated, which is followed by the subsequent stages, the number of which can vary depending on design. Usually, anti-surface ship ballistic missiles have one or two stages.

Then, the missile begins a free flight after dropping the engines to travel great distances at high speeds. The maneuverable reentry vehicles (MARVs) and decoys then begin to return to Earth's atmosphere at speeds of up to 18,000 mph, while reducing their speed to create better conditions for its own radar to detect the target.

Advantages of anti-ship ballistic missiles

These missiles have two main advantages:

The flight range is much longer than that of cruise missiles of the same size, as the range of these missiles reaches more than 2,000km. It is worth noting that flying a cruise missile this distance through the air will require much greater amounts of fuel, which increases the size of the missile and makes the launch vehicles larger and easier to detect, intercept and destroy.

They travel at much higher speed, which can reach more than eight times the speed of sound (the speed of sound in the air is 1,235 km/h), making them very difficult to intercept compared to cruise missiles (whose speed is less than the speed of sound) due to the small window for interception.

Anti-ship ballistic missiles and naval operations

Given the aforementioned decisive advantages of ballistic missiles, experts believe these missiles have changed the rules of the game. Why? Because they can allow a weaker naval force to implement a "sea denial" strategy, preventing stronger navies from carrying out operations or using the sea in a specific area. This is due to the heavy losses these missiles can cause, especially against the strike groups of aircraft carriers. To verify the accuracy of this assessment, let us discuss a number of facts.

Disadvantages of anti-ship ballistic missiles

The biggest weakness of ballistic missiles is the inaccuracy of their guidance system. In the best cases, with the use of the latest technology, this accuracy will be no less than 30 to 40 meters from the target location. Therefore, it is ideal for these missiles to be used against fixed targets on the ground, or with a nuclear warhead. However, if they are used against moving naval targets with a conventional warhead, this means that the missile will fall into the sea without affecting the target, and this constitutes a great challenge that cannot be easily overcome (the ability of these missiles to hit moving naval targets is doubtful).

Difficulty of managing the killing chain

The killing chain of these missiles begins with the target detection range, which should be more than the missile's effective range (1,500 km). This range is impossible to achieve with any coastal radar due to physical restrictions regarding of the nature of electromagnetic wave propagation. Over Horizon Radars cannot fulfill this task alone.

It is difficult for maritime patrol aircraft, submarines, or surface warships/commercial ships to come close enough for their sensors to detect carrier striking groups, as they would be highly vulnerable to the carrier group's weapons.

Even in the case of using satellites or unmanned aerial vehicles that can safely approach a carrier, it is difficult to continuously monitor hostile warships to determine their parameters and to identify false targets, commercial ships, neutral ships, allied ships, fishing boats...etc. This process is extremely important before completing the killing chain in order to avoid striking the wrong targets.

Anti-ship ballistic missiles and existing anti-missile defenses

Even in the case of successful detection, tracking, monitoring, classification and discrimination (which at this point is still a huge challenge), the next stage will depend on the C4ISR system, which is considered

the nervous system of the killing chain. This is also questionable in its efficiency. It is necessary to use communication, command and control, and computer and satellite positioning systems between each of the reconnaissance assets, operations centers, fire control systems and missile trajectory control systems to guide the missile to the future position of a hostile warship. This process is very complicated and needs continuous real-time information. This cannot be achieved while hostile warships have the capability of disrupting and confusing the system by using active electronic warfare measures, electromagnetic and infrared decoys and cyber warfare.

Modern warships also have the ability to intercept a ballistic missile during its ballistic trajectory and to target the warhead itself with on-board anti-missile defenses. For example, the American Aegis Ballistic Missile Defense System has been in service since 1990s on board US and allied cruisers and destroyers.

The US is also currently developing a modern seaborne system that achieves the following:

- Increasing the detection range of missiles since their launch and during their various phases of flight.
- Increasing the ability to distinguish between warheads and decoys traps.
- Increasing accuracy of target location and anti-missile guidance.
- Developing a high-energy laser to destroy missiles mid-trajectory.
- Developing decoys to deceive warhead guidance systems.

This ultimately reduces the effectiveness of these missiles against the warships of the stronger navies.

Ballistic missiles can lead to disaster

It is doubtful that deterrence can be achieved against a superpower the size of the US, although it can be achieved against a country that has less capable naval forces. The US, Russia and a number of NATO countries have since the 1970s had the ability to detect any ballistic missile the moment it is launched using special satellite sensors. Since such a missile could be carrying a nuclear warhead, which cannot be determined be-

fore impact (about 12-15 minutes from launch time), the actions taken by the military leaders of a superpower in response to a perceived nuclear attack could be disastrous.

Iran's Missile Force and Military Strategy

4

MARWA AHMED SALEM*

Iran owns a vast and diverse missile arsenal with thousands of ballistic and cruise missiles, capable of striking Israel, Southeast Europe, and American military bases in the Gulf. Although it hasn't yet tested or deployed a missile that's capable of hitting the United States, military experts believe it is heading towards the production of nuclear and intercontinental missiles, alongside continuing to refine the long-range missile specifications under the auspices of the Space Launch Program.

Moreover, the arsenal was not solely the product of events but was also tied to the country's military policy and strategy, which made it invest its energy in improving the accuracy and ability of these weapons. Based on the above, the missile arsenal has become a tool for highlighting the Iranian power and threatening the region.

Additionally, Iran is a major supply center for armed organizations, such as Hezbollah and Al-Assad regime, with a steady supply of missiles. Iran also supplied the Houthi rebels in Yemen with ballistic and cruise missiles that are developed at an increasing pace, as well as drones. Not to forget that it provides Shia militias with missiles and other small projectiles to use against Iraqi and American military and diplomatic installations.

*FELLOW OF THE NATIONAL DEFENSE FACULTY

In this context, this is an analysis of Iran's missile arsenal, both in its shape and how it is employed, missile tests, and exercises. There is a more comprehensive framework through which the missile arsenal must be read, and that is the Iranian military strategy.

First- Dimensions of The Iranian Strategy To Develop Its Missile Program:

Since the mid-1980s, Iran has adopted a strategy characterized by the development of ballistic missiles as a counter to threats in the region. Although; Iran's first attempt to build the ballistic missile system dates back to the Pahlavi Dynasty in 1977. The approach of the program changed decisively after the Iraq-Iran War (1980-1988) known as the War of the Cities, because Iranian cities were attacked by rockets, which led to a large number of casualties.

Iraq used missiles and directed all missile strikes at Iranian cities, especially after Iraq's land and naval defeat, which gave rise to the idea that the use of land and naval attack alone was not sufficient in the war. Iraq nearly invaded the entirety of the country with long-range missiles. Resultantly, the development of Iran's missile program is necessary with the assistance of Syria, China, North Korea and Russia, and crucial for Iran¹. The main driver for the development of Iran's missile program is to take advantage of its wars, then self-reliance, and to distrust the West and the United States.

After 2003 and the American attack on Iran, the idea of an American invasion of Iran became a threat, especially since the intensity of the American-Iranian conflict increased, as well as the obsession with the threat posed by Israel. The events were followed by the revolutions of the Arab Spring and the spread of terrorism and armed organizations. Iran has therefore adopted the "attack is the best defense" strategy and defended the territory of the State by attacking enemies under the shadow of the weakness of Iran's aviation weapon. In this sense, two main dimensions emerged: the first is using missiles in the proxy wars in both Syria and Yemen. The second is to continue developing the ballistic missiles and linking them with Iran's nuclear program as one of Iran's deterrence mechanisms in the region².

Iran's missile program is therefore crucial in its foreign and defense policy, which is strongly rooted in Iran's military strategy. It then proceeded to achieve self-sufficiency at all levels in the missile program, and looked forward to proving the accuracy of the missile with its various uses, whether using it in war or exercises.

This was majorly highlighted through the most recent confrontation between the United States and Iran in the region. The most notable of its events was the assassination of General Qasem Soleimani and Professor Mohsen Fakhrizadeh, alongside Iran's attack on the military bases of Al-Asad and Al-Taji in Iraq. Not to forget the provocative United States military action of sending American aircraft and B52 launchers to the Persian Gulf region. Additionally, Iran's political propaganda and the announcement of an advanced ballistic missile (Qasim), with a range of 1,800 km, and another naval missile known as Abu Mahdi, a cruise missile with a range of 1,000 km. This is all amidst the desire to avenge the assassination of Soleimani and Fakhrizadeh.

It is also expected to utilize the Iranian missile program to achieve other goals, as stated by the Iranian Chief of Staff of the Armed Forces, Mohammad Hussein Bagheri, after the agreement between the United Arab Emirates and Israel. The statement stated that Iran considers "the United Arab Emirates to be the source of instability in the region and will thus be a legitimate target"³. From the previous starting points, Iran currently possesses the largest missile stock, reflecting those events and its well-established military strategy.

Second- Functions of The Iranian Missile Arsenal:

Iran's missile arsenal includes short, medium and long-range missiles, and US reports indicate that it is in the process of making intercontinental missiles, as well as that the ballistic missile industry can carry nuclear bombs. The danger lies in Iran's possession of a powerful missile arsenal, linking it to Iran's military strategy of "attack is the best means of defense". Although the use of nuclear weapons is still a deterrent, due to its ability to destroy the countries of the region, it continues to be a strong concern of the regional and international community. The following table shows the main types of Iranian missiles:

Table 1: The Most Important Iranian Missiles

	<i>Name</i>	<i>Range (km)</i>	<i>Type</i>	<i>Mass of war-head (kg)</i>	<i>Length (m)</i>	<i>Fuel</i>	<i>Situation</i>
1	Sejjil	2000	Ballistic surface-surface	23540–650	17.9	solid	operational
2	Khorramshahr	2000	Ballistic surface-surface	1800–26000	13	liquid	Under development
3	Emad	1700	Ballistic surface-to-surface	750–17500	15.5	liquid	Under development
4	Qiam	800	Ballistic surface-to-surface	6250–645	unknown	liquid	operational
5	Fateh 110	300	Ballistic surface-to-surface since it has been modernized.	3670–500	8.9	solid	operational
6	Ghader	2000	Ballistic surface-to-surface	17458–640	15.86	liquid	Under development
7	Fateh 313	500	Ballistic surface-to-surface	4500–unknown	8.86	solid	operational
8	Soumar	2000	Cruise	1210–410	6	solid	operational
9	Hormuz	300	Anti-warship	600–unknown	unknown	solid	unknown
10	YA ALI	700	air-surface	670–120	unknown	solid	operational
11	Persian Gulf	300	Surface-to-Surface Ballistic	3730–450	8.9	solid	unknown
12	Kawsar	20	Cruise	100–30	2.6	solid	unknown
13	Ghader	1500	Cruise	unknown–200	7.4	liquid	unknown
14	Zolfaghar	700	Ballistic surface-to-surface	4620–450	10.3	solid	operational
15	Nasr	45	anti-warship	350–150	3.5	liquid	unknown
16	Noor	120	Cruise	715–175	6.38	solid	unknown

(Continued)

Table 1: The Most Important Iranian Missiles

	<i>Name</i>	<i>Range (km)</i>	<i>Type</i>	<i>Mass of war-head (kg)</i>	<i>Length (m)</i>	<i>Fuel</i>	<i>Situation</i>
17	Raad	350	anti-tank	23–12	0.98	solid	operational
18	BAVAR373	320	air-to-surface	Unknown	unknown	unknown	unknown
19	Mersad (Shahin)	45–80	air-to-surface	Unknown	unknown	unknown	unknown
20	Shahab-1	300	Scud surface-to-surface	5900–950	11.25	solid	operational
21	Shahab-2	500	Scud surface-to-surface	5900–950	11.25	solid	operational
22	Shahab-3	2000	Ballistic surface-to-surface	15000–670	15	liquid	operational
23	Fajr	43	surface-to-surface	407–85	5.2	liquid	unknown
24	DEZFUL	1000	Ballistic surface-to-surface	Unknown	12	solid	unknown
25	Zelzal 3	210	Ballistic surface-to-surface	3250–900	3.5	solid	unknown
26	Arash 4	40	Ballistic surface-to-surface	Unknown	2.89	liquid	unknown
27	Zafar	25	anti-warship	120–30	2.68	solid	unknown
28	ZOUBIN	20	air-to-ground	560–340	3	solid	unknown
29	Haj Qasim	1800	Ballistic surface-to-surface	7000–500	11	solid	unknown
30	Abu Mahdi	1000	Cruise	Unknown	unknown	solid	unknown
31	HOT	360	Underwater	2700–210	8.2	liquid	unknown
32	TEST–71	20	Underwater	1800–205	unknown	liquid	unknown

Source: Mohammad Eslami, Iran's ballistic missile program and its foreign and security policy towards the United States under the Trump Administration, *Revista Española de Ciencia Política*. Núm. 55. Marzo 2021, pp. 37–6?

The following illustration No. 1 illustrates the ranges of missiles and their access to neighboring states. Although the drawing is not accurate due to lack of information about Iranian missile sites, it is a strong indication of Iranian threats to the region.

Illustration No. 1 Iranian Ballistic and Cruise Missiles and their Ranges

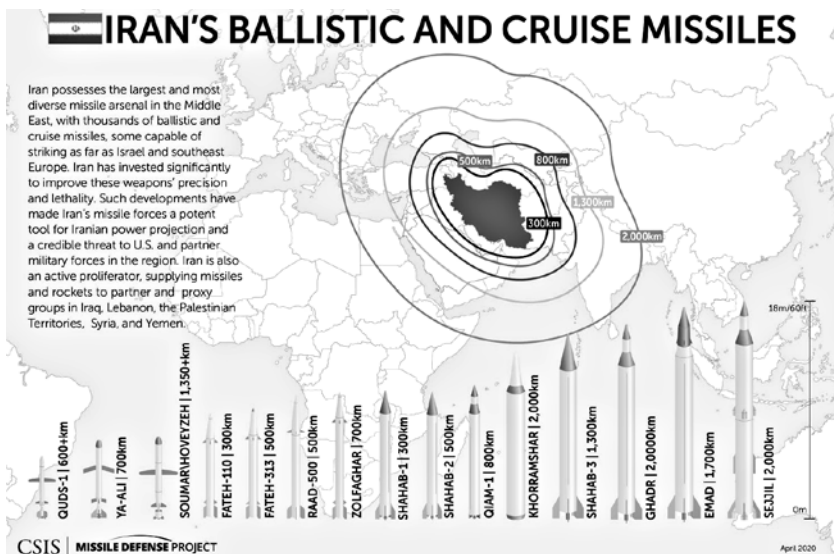


Table 1 shows the variety of missiles between short, medium and long-range, ballistic, anti-ship and cruise. Their diversity is due to the many modifications to the single missile, and they can be classified in a simplified manner as follows:

1. Short-range:

Iran possesses approximately 100 short-range ballistic missile tanker launchers. It is also very likely that it possesses hundreds of short-range ballistic missiles (SRBM). As a result, the majority of Iranian heavy artillery and ballistic missiles can be classified as tactical or short-range missiles (less than 500 km). This is to increase its ability to inflict severe damage if employed, as it may double the intensity of regular artillery fire. Furthermore, this can double the losses associated with the target of short-range missiles, even partially, and make up for the shortfall of air support missiles⁴.

Iranian missiles include Fajr-1, Falaq-1, Eqab model 83, Fajr-3 and Fajr-5 (ascending order in terms of range), and these are heavily involved in tactical operations. For this reason, it worked on developing other missiles that would reach important targets in neighboring countries, such as: Kuwait, Iraq, etc., until it developed most Iranian ballistic missiles, such as: Shahab-1 transferred from SCUD-B, Shahab-2 which is a copy of SCUD-C, as well as Zelzal-1, Zelzal-2, Zelzal-3, Fateh-110 missile, and Qiam missile⁵.

Iran regards the development of short-range ballistic missiles as critical for battlefield and tactical military purposes. As part of its military exercises, Iran frequently tests the firing of such missiles. Iranian short-range ballistic missiles (SRBM) could strike United States bases and allied forces in the Gulf region if transferred to operational bases and targets in Iraq. Thus, Iran can arguably use missiles with a range of 200 km from positions on its western coast to strike any target directly on the corresponding southern coasts in the Arabian Gulf region. Missiles with the farthest range of their territory can be used to reach the targets of the other bank of the Gulf, and they can reach deeper targets within the Gulf Cooperation Council states. Moreover, these missiles are often used by armed organizations.

From here, Iran has been able to become progressively self-sufficient in the production of short-range ballistic missiles, but may still rely on external suppliers, such as North Korea, to import some key components and materials. With the tightening of international export controls and the expansion of missile sanctions, under the Iranian nuclear agreement, this import has slowed, according to statements by Iranian officials.

2. Medium and Long-Range Missiles:

Iran is working on developing and producing a medium-range missile program with capabilities estimated at 2,000 km, which is enough to strike targets throughout the Middle East, according to the National Air and Space Intelligence Center (NASIC). In 2017, Iran owned around 50 medium and long-range missile launchers and an unknown number of missiles. Additionally, Iran continues to develop further testing of high-resolution ballistic missiles. These missiles represent two objectives: the first was a deterrent to any attack on them, and the second was the ability to launch attacks against American forces or any others, in the event of war. Iran has also built an underground missile stock network,

and seeks to improve its air defenses to protect ballistic missiles against a pre-emptive attack⁶.

Iran relies on North Korea for some of the key components and materials of the long and medium-range missile program. Although sanctions made exports to Iran more difficult, it was not impossible. As a result, Iran attempted to exploit the flaws in export laws of foreign corporations capable of circumventing those laws.

One of the medium and long-range missiles is Shahab-3, which is a ballistic missile with several versions. It was tested using solid propellant, and its range varies from 800 to 1,000 km, Iran is also seeking to develop it at a much longer range. Moreover, Ghader missile is considered an upgraded version of Shahab-3 and works with liquid propellant and is single-stage. The modified version of Ghader-1, the Emad missile, was tested in March 2016 and was declared in 2015 as a long-range ballistic missile that reaches 1,700 km. To add further, it is a modified version of the Ghader-1 with modified RV (air Re-entry Vehicle), a ground-to-surface missile capable of carrying nuclear warheads and capable of hitting the target with high precision, that can reach Israel, and is considered a deterrent weapon of Iran. The Sejil is a two-stage, solid-propellant and land-based ballistic missile, with a range of about 2,000 km, and was first announced as Ashoura in November 2007. The teste of the solid fuel engine failed at that time, and was later renamed Sajjil, flight testing was successfully carried out in November 2008, and some modifications were added and additional tests were carried out until Sajjil-2 was registered in May, September and December 2009. From the previous premise, the Sajil-2 missile highlighted the significant progress of Iran's solid-propellant missile program, thus reducing the response time to any attack and the risk of detection⁷.

In addition, the Fajr-3 systems began to be developed in the mid-1990s, based on the design of similar North Korean systems, which are intended for 240mm rocket artillery. Each vehicle carries 12 rockets that can be launched sequentially in just two minutes, and each missile carries a warhead of 90 to 120 kg. Not to forget that the maximum range reached for each rocket is around 45 km. The most important system in this regard is Fajr-5, Dedicated to 333 mm rocket artillery, which also began to be developed during the 1990s. Its first models were based on missiles with a range of 75 km, carrying warheads of 90 to 175 kg, but were then developed to exceed 100 km⁸.

The recent period has seen a series of rockets. Images of an underground missile factory described as an “underground city” have been published. Additionally, Iran has announced the Dezful missile, an upgraded version of the Zolfaghar missile, which has a range of 700 kilometers, carrying a warhead weighing 450 kg. The new missile goes by the name of the western city of Iran near the Iraqi border of Dezful or Despol, located in northern Khuzestan province on the foothills of the Zagros Mountains and on the bank of the river Dez.

This happened only days after Iran revealed a new cruise missile with a range of 1,300 km, during a parade at celebrations commemorating the 40th anniversary of the Islamic Revolution in 1979. Iran also states that it has missiles with a range of 2,000 km, which puts Israel and United States military bases in the region in the crosshairs of these rockets⁹.

Iran’s ambitions did not end there; it also had plans to launch a satellite program. Despite its failure, it planned to use future launches to put intelligence-gathering satellites in orbit. Iran presently operates two types of space missiles: The Safir and the Simorgh, both of which are two-stage, liquid propellant missiles capable of placing payload in low Earth orbit.

Iran used the Safir SLV rocket to launch the OMID satellite into orbit in February 2008. Some US reports and media at the time pointed to Simorgh’s explosion shortly after launch, and there is no evidence that it reached orbit¹⁰.

According to experts, the progress of rocket use in space masks the development of an intercontinental ballistic missile (ICBM) with a range of more than 5,500 km, which could threaten targets throughout Europe, and even the United States. It is reported that in 1999, the International Commission first provided that Iran could test an intercontinental ballistic missile if it obtained adequate external support, mainly from China or Russia.

The integration of Iranian missile types thus gives Iran full defensive capability in its offensive form in accordance with Iran’s military strategy, and covers military territorial trends that pose a threat to it. Moreover, the Iranian tests and exercises that will be examined later will cover more Iranian missiles specifically in the maritime field. The possibility of developing an intercontinental missile and a nuclear missile remains under way amidst attempts to create space rockets and develop ballistic missile industries capable of carrying a nuclear missile.

Third- Iranian Missile Tests and Their Accuracy:

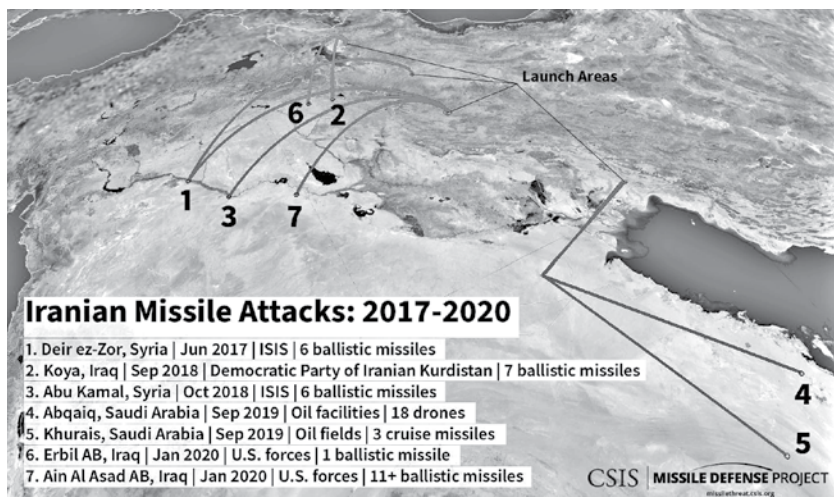
Missile tests are the best measure of their accuracy and ability to hit a target. Iran has conducted tests and exercises from the 1980s to 2020, which can be illustrated in the following table:

Table 2- Iranian missile strikes

<i>Date</i>	<i>Strikes</i>
1980s	Tehran struck Iraqi cities, including Baghdad and Kirkuk, which is rich in oil, with SCUD-B missiles and was able to hit targets.
1994–2001	A Shahab-1 missile, which is a modified version of SCUD-B, was launched on bases in Iraq that are inhabited by People's Mojahedin Organization.
2017	The Islamic Revolutionary Guard fired five to six missiles at an IS command center and a car bomb assembly site in the eastern Syrian province of Deir Ez-Zor. The short-range ballistic missiles fired from trucks cut more than 600 km (370 miles) from Kermanshah and Kurdistan provinces in western Iran.
2018	In September 2018, Iran fired seven Fateh 110 missiles at the alleged headquarters of the Kurdistan Democratic Party of Iran and the Kurdistan Democratic Party of Iran in Koya, Iraq.
2019	In September 2019, Iran launched coordinated drone and cruise missile attacks on Saudi oil installations in Buqayq and Khurais, showing a high degree of accuracy. Additionally, temporarily halted production at the Buqayq oil refinery, which provides 5–7% percent of the world's daily oil.
2020	In January 2020, Iran bombed US forces in Iraq for several hours with up to 22 ballistic missiles in retaliation for the US killing Qasem Soleimani. The attacks destroyed United States installations at the air base west of Baghdad, leaving more than 100 United States service members with brain injuries.

Source: The researcher collected information from various sources

Illustration 2 of Iranian strikes from 2017 to 2020



Source: CSIS, missiles of iran, august 10, 2021

In the 1980s, Tehran deployed missiles during its eight-year war with Iraq, when President Saddam Hussien launched “War of the Cities” and the missiles penetrated deep into Iran. Tehran mainly responded with SCUD-B missiles, whose range reaches 300 km (185 miles). Iraq cities such as Baghdad and Kirkuk, which is oil-rich and situated in the north, were shot. Between the years 1994 and 2001, Iran launched the Shahab-1 missile, an alternative to SCUD-B with a range of 300 km (185 miles), at bases in Iraq that are used by the People’s Mojahedin. Iran didn’t launch any missiles on the course of the next 16 years, yet it continued developing and testing short and medium-range ballistic missiles¹¹.

In 2017, the Revolutionary Guard fired five to six solid propellant missiles, with a range of 700 km, at an IS command center and a car-bomb assembly site in eastern Syrian province of Deir Ez-Zor. They may have also fired a Qiam-1 missile, which is liquid propellant and has a range between 700-800 km (440-500 miles). The Revolutionary Guard said that “a large number of terrorists have been killed and their equipment, systems and weapons have been destroyed”. The short-range ballistic missiles, which were launched from trucks, travelled more than 600 km (370 miles) from Kermanshah and Kurdistan provinces in western Iran. The operation was in response to two IS attacks on Iran’s parliament

and the mausoleum of the late revolutionary leader Ruhollah Khomeini on June 7, 2017¹².

In September 2018, Iran launched seven Fateh-110 missiles at the alleged headquarters of the Kurdistan Democratic Party of Iran and the Democratic Party of Iranian Kurdistan in Koya, Iraq.

In September 2019, Iran launched coordinated drone and cruise missile attacks on Saudi oil installations in Buqayq and Khurais. The attack displayed a high degree of accuracy and it temporarily halted the oil production in the Buqayq oil refinery, which provides 5-7 percent of the world's daily oil.

On January 7, 2020, Iran launched 16 short-range ballistic missiles, which were launched from three different internal locations. They hit different Iraqi army targets, including United States military facilities, as well as the Assad airbase and another airbase near Erbil in northern Iraq. The attack was a retaliation for the killing of Iranian military commander Qasem Soleimani, and it demonstrated progress in the accuracy of Iranian missiles. The short and medium-range ballistic missile tests indicate this, and here Iran focuses on increasing the accuracy of its missiles¹³.

As for Iran's recent exercises during 2021, they represented an escalation in the maritime defense level. This is within the context of the Gulf and United States, as a response to the naval and air military movement in the Gulf region. The Iranian Revolutionary Guard deployed anti-ship missiles at several points on the strategic island of Qeshm, which directly overlooks the Strait of Hormuz. The missiles' maximum range of 100 km, with explosive warheads of up to 155 kg, as well as the deployment of rocket-propelled grenades, Fajr-3 and Fajr-5. New tactics emerged in the Eghtedar 99 and the Great Prophet exercises, including the use of ballistic missiles in maritime defense, as well as using various types of drones; in order to provide information and fire backup during ballistic attacks. Additionally, two roles were assigned in the exercises, one offensive and the other defensive.

The most prominent rocket in the Great Prophet-14 exercise was the ballistic missile, Zolfaghar, which belongs to the Al-Fateh missile family. Yet this missile is characterized by a small margin of error and a greater range than the rest of the series. Moreover, it has a maximum range of 700 km and can carry various versions of explosive heads, with a total load of 580 kg. One of the most important advantages of this missile is

that it can be loaded with a self-moving warhead that's disconnected from the body of the missile near the target, and that's after the missile rises to the upper atmosphere. This reduces the time available to the air defenses to counter approaching missiles¹⁴.

During these exercises, other missiles were also used, including the Hormuz anti-maritime missiles. This type has multiple guidance mechanisms, combining passive and positive radar guidance, so that the missile is resistant to interference and disability attempts. This species also has a warhead of up to 600 kg. Consequently, this type of missile has become one of the main arms of Iranian deterrence against large military objects, such as aircraft carriers.

During these exercises, the launch of the newer version of Fateh ballistic missiles, called Fateh-313, with a range of about 500 kilometers, powered by solid fuel, was demonstrated and was used for the first time operationally prior to these exercises. To explain further, this was the rocket attack on the US airbase of Al-Asad in Iraq last January, where a new fixed launch platform, and underground launch platforms, emerged.

It should be noted that the Great Prophet-14 exercises have seen the use of conventional defensive modes against naval pieces, such as the Nasr missile launched from helicopters, and its land version, the Nasir, along with the Nasr-1 version launched from fast attack boats. Additionally, the Sukhoi Su-17 bombers have been used to target the US aircraft carrier's parade, via the drop-off bomb, which is Yasin-type and TV-directed¹⁵. In addition, air-to-air missiles are tested on board suicide drones (Karrar), carrying out air defense missions during the main attack, as well as defending themselves against attempts to destroy them by hostile aircraft during flight. This aircraft carried a locally-made missile, similar in design to the United States air combat missile Sidewinder. Hence, it was able to secure the Strait of Hormuz and achieve maritime offensive capability in the Gulf.

Why is the missile program a concern?

Iran's missile program is a concern to regional countries and the United States due to the nature of the missile program and its link to offensive strategy. There are several other branched and detailed reasons related to the nature of the conflict zone, in which regional roles stand out, as well

as the nature of the ballistic program capable of carrying nuclear heads, etc. Seeing the missile program in the reality of the territory with its changing events is therefore important to answer the key question: Why is the missile program a concern? This can be detailed as follows:

1. The use of Iranian missiles in the region's conflicts

The areas of influence include regional countries like Syria, Lebanon, Iraq, Yemen and the Gaza Strip. As usual, Iran's missile uses are highlighted on the ground, by supplying its allies and agents with ballistic missiles and short-range cruise missiles. This is because these weapons enable Iran, through its allies, to show its strength in the region. This led the US Foreign Affairs Minister Assistant, Yleem Poblete, to say that Iran's missile program disturbs the stability in the Middle East and increases the risk of a "regional arms race" by supplying weapons to armed groups in Lebanon and Yemen. Although the US's statements come in a climate of conflict, Iran considers the use of missiles to support its influence in the region, and powerful pressure sheets in the nuclear file. Therefore, its missile program carries both military and political aspects.

Amir Ali Hajizadeh, commander of Aerospace Force of the Iranian Revolutionary Guard, confirms that all missiles in Gaza and Lebanon were supported by Iran. This was following the American escalation in the region and the murder of Qasem Soleimani. Moreover, it's also the first offensive line against any American or Israeli escalation.

Thus, Iran is tactically seeking to cover the territory with military and missile influence to become a pressure sheet in the Iranian file and, in the event of escalation, to have the capacity to disperse the enemy's capabilities.

2. Iran and the Strait of Hormuz

The escalation between the West and Iran in the Strait of Hormuz raises concern around the protection of maritime navigation in the Strait. The reality of the issue is that Iran has lately developed its air weapons alongside its naval weapons, in response to the American escalation in the region. Additionally, recent exercises proved Iran's missile capability to attack in the Strait of Hormuz, this is combined with detention of a number of oil tankers in the Strait in 2019. Thus, in the event of a military escalation in the region, the Strait of Hormuz would be one of the

tactical instruments used to pressure the parties to withdraw or reverse their position.

3. Indicators for the manufacture of intercontinental missiles

Despite rumors of Iran testing intercontinental missiles and the US' doubts about this matter, the pace of recent missile updates suggests that Iran could develop an intercontinental missile industry. This is because of its closer reliance on the Korean and Chinese missile industry, which has always sought to develop intercontinental missiles to deter the United States of America. In addition, the development of the range of recent missiles is proceeding at a faster pace, these include the single-stage Khorramshahr missile, with a length of 13 meters, a range of 2,000 km, capable of carrying a warhead weighing 1,800 kg and having a caliber greater than previous Iranian models, possibly in order to accommodate a new propulsion system and liquid fuel in larger quantities in a shorter structure. The missile's no-fin design indicates the adoption of a new control and guidance system. More importantly, it offers Iran the option of transporting the missile in hot deserts and cold mountain areas within a handling container, which provides increased flexibility and contributes to a better controlled handling environment. Thus, the development of missile propulsion capabilities is proceeding at a rapid pace, and missile capabilities are increasing to deal with different environments. United States officials estimate that Iran's work to launch a spacecraft shortens the time for the intercontinental ballistic missile (ICBM), because they use the same techniques.

4. Ballistic missile capability to carry nuclear heads

Ballistic missiles reportedly have the capability to carry a nuclear weapon. This is due to the warhead's ability to carry the weight of nuclear bombs. The Sajjil is a medium-range missile, with a range of 2,000 km, two-stage, solid-propellant and vehicle-mounted missile. The missile is 18 meters long, 1.25 meters in diameter and can carry a conventional or nuclear head, as well as a Soumar missile that can be launched from ground bases, 7.24 meters long, 51 cm in diameter and can carry a conventional or nuclear head. This coincides with the announcement by the head of Iran's Atomic Energy Organization Ali Akbar Salehi, that Tehran had begun enrichment of 60 percent uranium at the Natanz facility. Salehi said: "We produce about 9 grams of enriched uranium 60 percent

per hour, but we have to make arrangements to reduce production to 5 grams per hour.” Thus, raising its uranium enrichment capabilities to this level will make Iran able to move faster towards having uranium enriched at 90 percent and above, which is required for the use of this raw metal for military purposes.

5. The defense capability of neighboring states vis-à-vis Iran's missile program

Despite the development of a missile defense system in the Gulf, many military analysts believe that efforts should be consolidated towards further development of western and regional forces in the Gulf to counter ballistic missiles, short and medium-range missiles and unmanned aerial vehicles (UAV). Iran could launch rocket and drone attacks against Israel from Syria, Iraq, and its own territory. Another possible front emerged when Iran's Houthi partners in Yemen threatened to fire rockets at Eilat in southern Israel.

Additionally, Iran directly threatened the Emirates, and could theoretically flood the country with a wide variety of missiles and short-range drones and long-range tactical missiles. Furthermore, Iran has forced Saudi Arabia to evacuate many small towns along its southern border because of Houthi missile and marching aircraft attacks with Iran's help. In 2017, the Houthis began firing ballistic missiles and medium-range Iranian marching aircraft into Riyadh and the Yanbu economic center; they also targeted Jeddah. In the north, Iran has fired drones and mobile missiles into Saudi Arabia twice in 2019, from Iraq and its territory, including the major attack on Buqayq, the world's largest oil processing plant, which means that the Iranian system has a strong impact on the region, despite its missile defenses. Israel has a multi-tiered operational missile defense system and extensive operational experience in operating parts of it (Iron Dome System), which intercepted some 2,000 rockets.

At the same time, however, the Gulf states are well located to monitor launch sites in Iran and Yemen that Israel cannot easily monitor. Following five years of strikes in and from Yemen, Saudi Arabia and the United Arab Emirates have substantial experience dealing with modern missile and drone threats. Despite recent economic challenges, the Gulf states are still able to offset some of the cost of missile

defense research and development that the United States bears every year. The missile system therefore covers the area, but the states of the region still have weaknesses that must be developed.

From previous points of view, Iran is a source of concern for the region since it has the capability to launch missiles accurately from within it and from dispersed areas of the territory in parallel, and thus has the capability to disperse enemy force, along with nuclear deterrence and navigation control in the Strait of Hormuz. However, there were not the only reasons that prevented Iran from including Iran's missile program in the negotiations, but there was a major reason associated with Iran's internal military status. The Iranian missile program is the backbone of Iran's military system, and with its loss, the power on which Iran rests as a regional weight and as a defense force for the state will collapse.

In the final analysis, Iran peruses an offensive military strategy, one of the main pillars of which is the small, medium and long range missile arsenal utilized by armed organizations in the region. It also poses a severe threat to United States military bases in the Gulf region, and Israel, which sees it as one of the main threats in the region and Eastern European States.

In accordance with the above-mentioned events, it has been able to defend the Strait of Hormuz against any military escalation. It has also been able to achieve an attack on the Strait from a distance of up to 2,000 km. In addition to its efforts to develop the air force, the latter still has many developments in order to be integrated with the missile defense system, which has reached a point of variety and diversity as the largest missile arsenal in the Middle East.

Although Iran's ballistic system is capable of carrying a nuclear weapon, it has not yet reached that point, and there is still controversy over the existence of intercontinental missiles, there are no indications of this. Yet, if it proceeds with the current pace of missile development, it will have access to developing an intercontinental missile that reaches the heart of the United States, but follows military tactics capable of averting the enemy in the region.

References

1. Mohammad Eslami, Iran's ballistic missile program and its foreign and security policy towards the United States under the Trump Administration, *Revista Española de Ciencia Política*. Núm. 55. Marzo 2021, pp. 37–62
2. Idem
3. Bagheri, M. 2020. August 15). UAE will be our legitimized target. Deutsche Welle. Available: <https://www.dw.com/fa-af/> (accessed: August 15th 2020.).
4. Iran's Ballistic Missile and Space Launch Programs, congress reaserch service January 9, 2020,p1.
5. Missiles of Iran, August 10, 2021: <https://missilethreat.csis.org/country/iran>.
6. Ibed, ,congress reaserch service January 9, 2020,p3.
7. Idem.
8. Mohamed Mansour: Naval messages...A reading of the recent Iranian missile exercises <https://marsad.ecss.com.eg/49659/>
9. Iran unveils the Ballistic Dazful and an underground missile factory: <https://arabic.euronews.com/2019/02/08/watch-iran-reveals-new-surface-to-surface-ballistic-missile-shows-off-underground-factory>
10. Missiles of Iran, August 10, 2021: <https://missilethreat.csis.org/country/iran>.
11. Garrett Nada, Iran's Missiles: Timeline of Attacks, February 17, 2021: <https://iran-primer.usip.org/blog/2021/feb/17/iran%E2%80%99s-missiles-timeline-attacks>
12. Idem.
13. Missiles of Iran, August 10, 2021: <https://missilethreat.csis.org/country/iran>
14. Mohamed Mansour: Naval messages...A reading of the recent Iranian missile exercises. <https://marsad.ecss.com.eg/49659/>
15. The same previous source.

Missile Capabilities of GCC States in the Face of Security Challenges

5

STAFF MAJ. GEN. CAPT. IMAD MOHSEN*

The security determinants of the Arabian Gulf region are mainly characterized by being interconnected with regional and international factors shaped by the geopolitical realities in the Gulf States that are united under the umbrella of the Gulf Cooperation Council (GCC), the entity that oversees the world's largest sources of oil and important sea lanes that regulate oil trade movement to the eastern and western hemispheres.

The GCC comprises six countries, namely the Kingdom of Saudi Arabia (KSA), the United Arab Emirates (UAE), Kuwait, Qatar, Bahrain, and the Sultanate of Oman. These six countries constitute the majority of the Arabian Peninsula and collaborate with one another in several areas including military cooperation that brings under its umbrella six militaries armed with the latest military technologies.

The six GCC states have a population of about 53 million. As far as the military gear is concerned, the six GCC countries have a total of 1,862 aircraft, 2,250 tanks, 40,00 armored vehicles, 400 self-propelled artillery, 2100 field artillery, and 143 rocket launchers, in addition to 309 multiple naval assets. The combined annual defense spending of the

*ADVISOR TO THE ARMED FORCES CENTER FOR STRATEGIC STUDIES, NASSER HIGHER MILITARY ACADEMY.

GCC countries amounts to \$155.1 billion (KSA: \$67 billion, UAE: \$22.7 billion, Kuwait: \$6.8 billion, Qatar: \$6 billion, and Bahrain: \$1.4 billion)¹.

Security Risks and Threats to Gulf States

The GCC states are located in a volatile region that is rife with conflicts. In addition to their proximity to several unstable conflict-prone countries like Iraq, Yemen, and Syria, they are faced with the threat coming from Iran in its ambitious pursuit of acquiring nuclear weapons.

In terms of military strength, Iran's military personnel outnumbers those of all Gulf States altogether. In addition, Iran towers above Gulf States in land-based weapons, has the fourth-largest naval fleet with a total of 400 naval assets, and has the fourth-largest submarine fleet with a total of 32 submarines while Gulf countries have only few submarines.

Yet Gulf countries compares favorably with Iran in aerial weapons, particularly the US fourth-generation fighters. While Iran is the fourth missile power in the world, after the United States, Russia, and China, Gulf States possess US missile batteries that can intercept ballistic missiles at a range of 50-100km.

Although the United States is still highly committed to ensuring stability in the Arabian Gulf states for their vital role in exporting oil and gas to the world, reducing the US defense spending and adjusting the US global strategy towards Asia may bring about a drawdown in the US troops in the Gulf, even if the Iranian threat continued to increase all over again.

In its Joint Comprehensive Plan of Action (JCPOA) with Iran, the United States implicitly left gaps for Iran that facilitate its possession of nuclear weapons. The JCPOA is far beyond being a technical agreement; it is part of a regional and international order that is starting to take shape towards reconfiguring the regional order, its security, and borders. This could result in marginalization of the role of Gulf States, pushing them towards a defining battle in the face of these challenges².

Maintaining a substantial US military presence along with strengthening the military capabilities of GCC states don't seem to offer a durable solution in the long run. However, Gulf States still favor relying on

the US military as a fundamental pillar of its defense strategy. That said, militaries of Gulf States are increasingly becoming dynamic backed up by modern technology, military equipment, and highly-qualified human resources.

The absence of major powers that could establish “full” control over regions promoted aspirations of regional states for hegemony. Overall, influential powers in the Gulf region are confined to three forces: Iran that always aspires to possessing capabilities that ensure the balance of power tilts strongly to its favor rather than the Gulf States; the Western powers that have substantial interests in the Arabian Gulf region and have sufficient power that could make the aspirations of the hegemon a hard-won; and Gulf States, a powerful active force in the region³.

Given this regional context, Gulf States should rethink their long defense reliance on the United States by considering new multilateral defense initiatives rather than restricting themselves to the bi-lateral collaboration with the United States while concurrently working on building their defense capabilities.

In the Gulf, the KSA and UAE are on the forefront in terms of modern advanced military capabilities. Both countries allocate a substantial portion of their budget to defense spending. Below we review the missile capabilities of GCC states including their ballistic missiles capabilities, surface-to-air missiles, air-to-surface missiles, surface-to-surface missiles, and air-to-surface and surface-to-surface anti-tank missiles.

Missile Capabilities of GCC States

Saudi Arabia’s Missile Defense Capabilities

I- The Ballistic Missiles

A project known to the Ministry of Defense as the “Falcon” [Al-Saqr] Strategic Missile project formed the nucleus of the Royal Saudi Strategic Missile Force (RSSMF).

Saudi Arabia possesses many strategic missiles spread over several bases. These missiles include a variety of Pakistani-made ballistic missiles, inter alia 180 DF-15 missiles that have a maximum range of 6000 km, DF-3A which has a maximum range of 4000 km, and DF-M1 that has a maximum range of 2,500 km.

A. Missile Bases in the KSA

- **Al-Watah Base**, located in Al-Watah area, 201km of the capital, Riyadh
- **Al-Sulayyil Base**, the first Saudi ballistic missile facility built between 1987 and 1988 near the town of Al-Sulayyil (450 km from Riyadh)
- **Al-Juffair Base**, otherwise known as Base 511, located in Al Hariq town, 180km south of Riyadh
- **Ar-Rawdah Base**, otherwise known as Base 533, located in Ranyah governorate
- **Base 566**, approximately 750km northwest of Riyadh
- **Base 522**, located in Wadi Ad-Dawasir

B. KSA Ballistic Missiles Gear

- Medium and intermediate-range DF-3A missiles (2800–4000 km)
- Short and medium range DF missiles (1900–2500 km)
- Intermediate-range CSS-5 (4000–5500 km)
- Intermediate and intercontinental-range CSS-6 missiles (5000–6500 km)
- Short and medium-range DF-11 (900–1500 km)
- Intercontinental-range DF-31 (6000–11000 km)
- CSS-2 missiles



C. Medium-Range Missiles

- Ghauri (1100–2300 km)
- Shaheen (2000–2200 km)

D. Short-Range Missiles

- Grim-2B (50–550 km)

In August 2010, International Policy Digest⁴ revealed that the KSA was developing a domestic ballistic missile program with direct support from China, in a factory situated at an existing missile base near the town of al-Dawadmi, 230 kilometres west of Riyadh.

II- Navy Missile Capabilities

The Royal Saudi Navy Forces (RSNF) is organized into two fleets, namely the Eastern Fleet which operates in the Arabian Gulf and Sea of Oman and the Western Fleet which operates in the Red Sea. In 2001, RSNF's manpower was estimated at 12,500 navy personnel and 3,000 Marine Corps.

The RSNF possesses three French-built al-Riyadh class frigates, i.e. the modified version of "La Fayette" frigate, all of which are fitted with a helipad for medium-sized helicopters of Eurocopter Dauphin, Eurocopter Panther, and NH90 models, armed with Ester-15 and Exocet missiles.

The RSNF has 13 USA-built gunboats or corvettes, including 4 Tacoma-class missile picket ships (known in the RSNF by the name "Badr") armed with Harpoon surface-to-surface missiles.

III- Air Force Missile Capabilities

The Royal Saudi Air Force (RSAF) aircraft carry multiple and varied missiles including the following:

- **Air-to-ground** attack missiles such as Storm Shadow, AGM-65, air-to-ground guided missile, and Brimstone ground or air-launched attack missile
- **Air-to-air missiles** including Meteor, Skyflash, IRIS-T, AIM-9 Sidewinder, and AIM-120
- **Air-to-ground** anti-radiation missiles including AGM-88
- **Anti-ship** missiles including Exocet, Harpoon, Sea Eagle, AS15TT, Otomat

IV- Air Defense Missile Capabilities

The Royal Saudi Air Defense Forces (RSADF) is the force concerned with ensuring full protection of the Kingdom's airspace in association with the Royal Air Force. The RSADF defense systems are among the most advanced air defense systems in the Middle East. Below, we review the missile capabilities of the RSADF.

Long-range Missiles

THAAD System, a ground-based air defense missile system and one of the main components of the anti-ballistic missile defense systems. THAAD radar can identify threats of incoming missiles at ranges up to 1,000 km. The THAAD system can intercept short and medium-range ballistic missiles both inside and outside the Earth's atmosphere⁵.

Medium-range Missiles

- The Patriot, a US-built air defense system that proved efficiency in the Gulf War as an anti-aircraft and anti-ballistic missile weapon.
- The Crotale System, a French air defense system with a range of 5000 - 8500 meters.
- The Shahine System, a developed version of the Crotale for Saudi Arabia.

Man-Portable Missiles

Anti-aircraft missiles including Stinger, Red Eye, and Mistral.

V- Military Industrialization Capabilities

In August 2017, several development paths were identified aimed at promoting the military industrialization capabilities toward Saudizing the industry. Under this direction, the number of military licensed businesses (national, transatlantic, and mixed ones) reached 99 companies, with Saudi defense firms accounting for 85 percent of them, which promotes national sovereignty, makes the Saudi decision demonstrably free of any pressures, and helps bring economic benefits.

VI- Space Capabilities

The Saudi Space Commission (SSC) was established on December 27, 2018, to implement Saudi Arabia's National Space Strategy. Between 2000 and 2019, the SSC managed to launch 16 satellites, including the Saudi communication satellite SGS1 launched on February 6, 2019, that serves the multiple modern satellite communications sector, which includes broadband communications and secure military communications.



The structural parts of the Saudi satellites are manufactured in the mechanical workshop of King Abdulaziz City for Science and Technology (KACST), where there is a special team at the Institute of Space and Aviation Research that builds the electronic panels required to optimize the operation of the satellites in space, which are pre-designed by specialized engineers at the center as per the international standards.

The UAE's Missile Defense Capabilities

I-Ballistic Missile

The UAE has 6 launchers and 20 Scud-B missiles.

II- Air Defense Missile Capabilities

The UAE Air Force possesses a very advanced air defense system that includes al-Tariq missile, THAAD and Patriot missile systems, as well as man-portable missiles such as the Mistral and Blowpipe.



III- UAE Navy Missile Capabilities

The missile capabilities of the UAE Navy include the “501 Abu Dhabi” and “502 Emirates” frigates (two Dutch Kortenaer frigates) both fitted with eight Sea Sparrow anti-aircraft missiles, two German-made Lurssen-62 class ships called Murajib armed with eight Exocet-MM40 missiles and eight short-range anti-aircraft Crotale missiles, eight missile attack launches of Lurssen, known by the UAE name of “al-Mubarriz” and “Baniyas”, each of which is armed with four Exocet MM40 missiles.



IV- Surface-based Anti-tank Missile Capabilities

- HOT, Tau, Milan, and Vickers Vigilant missiles.

V- Air Force Missile Capabilities

- Air-to-air Missiles, including Magic, Sidewinder, AMRAAM, and MICA missiles.
- Air-to-ground Missiles, including Maverick, Hellfire, Hydra, HOT.

VI- Space Capabilities

One major UAE deal that worth mentioning here is the UAE’s purchase of two Falcon Eye spy satellites, which marked the first big contract between France and a GCC country on advanced intelligence satellite technology.

The UAE has officially entered the global space exploration race in July 2015 with Sheikh Khalifa bin Zayed Al Nahyan issuing a decree to establish the UAE Space Agency. On February 9 2019, the first Arab probe, Hope Probe, was sent to Mars, led by an Emirati team, and reached Mars’ orbit at 7:42 p.m. the same day.

VII- Military Industrialization:

To reduce dependence on foreign military hardware and promote the local military industry, the UAE started producing a significant amount of military equipment. In this respect, Abu Dhabi Ship Building (ADSB) Company managed to successfully build a range of vessels. The company has a program dedicated to the design, development, and production of 5-6 types of warships meant for sailing in the shallow waters of the Arabian Gulf.

The UAE also manufactures multiple munitions, military transport vehicles, drones, and light weapons, in addition to developing a training and light combat aircraft based on Mako stealth technology by the UAE Air Force in collaboration with EADS⁶.

Qatar's Missile Capabilities

While Qatar is a small country in terms of population and geography, it is one of the countries that is striving to develop its military capabilities quantitatively and qualitatively, particularly given the economic prosperity it achieved in the 1990s that accelerated moving in this direction, notably in the past few years.

I- Ballistic Missiles

On 15 December 2017, during the national day parade, Qatar unveiled the advanced Chinese-made SY-400 ballistic missile system that has a claimed range of 400 km.

II- Navy Missile Capabilities

Qatar has five naval bases, i.e. Al-Daayen Base, the largest naval base in Qatar inaugurated in 2019, Doha Base, where the Qatari Emiri Navy (QEN) is headquartered, Halul Island Base, the Ras Abu Aboud base, and the Hamad Port –Qatar's largest and newest port officially opened in 2017– which the QEN uses as a naval base.

The QEN possesses Vita vessels that are armed with French-built anti-ship MM40 Exocet missiles and short-range air defense Mistral missiles.

III- Air Defense Missile Capabilities

Qatar possesses an air defense system acquired from Raytheon, a US corporation, as part of a \$2.5 billion deal, in addition to surface-to-air missiles known as NASAMS.

IV- Air Force Missile Capabilities

The Qatar Emiri Air Force possesses 98 military aircraft, including 9 fighters and interceptors, 15 attack aircraft, in addition to military transport and training aircraft. According to GlobalFirePower data, the Qatari military has 43 military helicopters.

Oman's Missile Capabilities

The Royal Army of Oman (RAO) is a modern, developed, and integrated force in terms of structure, armament, and organization. The RAO was established in 1907 and has a total of nine infantry regiments and three artillery regiments.

I- Ballistic Missiles

Oman holds one of the world's largest stocks of Scud missiles with more than 30,000 ballistic missiles⁷.

II- Navy Missile Capabilities

In 1973, Oman added three fast patrol boats to its naval fleet, namely Al-Bushra, Al-Mansoor, and Al-Najah, and Sultan of Oman Navy moved to Sultan Bin Ahmed Naval Base at Khor Al-Mukalla in Muscat.

III- Air Defense Missile Capabilities

Oman's air defense missile system include:

- Rapier 2000
- Oerlikon and Sky guard missile Systems (using the same radars)
- ASPIDE (Italian-Swiss)
- The French VL MICA system that has a range of 15 km
- SLAMRAAM Missile, a surface-based version of the US AMRAAM
- Avenger, a medium-range missile system of 40 km
- Patriot Pak 3, Patriot and THAAD (unconfirmed).

IV- Air Force Missile Capabilities

- Air-to-air Missiles: 70 MPDA and R.550 Magic
- AIM-9 Sidewinder
- AIM-120 AMRAAM
- 310 AIM-9M Sidewinder
- Air-to-surface Missiles: Boeing's Harpoon (D model), AGM-65 (D Model), and Maverick (G Model)

V- Ground-based Anti-tank Missile Capabilities

- Blowpipe and TAU.

Bahrain's Missile Defense Capabilities

The Bahrain Defense Force (BDF) comprises the Royal Bahraini Air Force, the Royal Bahraini Army, the Royal Bahraini Naval Forces and the Royal Medical Services of the Armed Forces.

I- Navy Missile Capabilities

- Harpoon, MBB Bo 105, and RIM-66
- Exocet

II- Air Defense Missile Capabilities

- US MIM-23 Hawk Patriot missile batteries
- Patriot PAC-3 batteries that can defend against ballistic and cruise missiles, and aircraft⁸.
- A number of US, French, Swiss, and English missiles, including primarily the British man-portable Javelin, the US man-portable Stinger, and the French anti-air Crotale⁹. Bahrain looks forward to purchasing the Russian-made S-400 missile system.

III- Air Force Missile Capabilities

- Three F-16 Falcon Fighter Squadrons
- Six F-5 squadrons
- 5-BAE Hawk Squadron
- AMRAAM air-to-air missiles

IV- Ground-based Anti-tank Missiles

- TAU
- FIM92A Stinger
- FGM-148 Javelin
- M133 Cornet

Kuwait's Missile Defense Capabilities

The Kuwaiti Armed Forces are the regular force of the State of Kuwait. It comprises the Kuwait Land Force, the Kuwait Air Force, the Kuwait Naval Force, and the Kuwait National Guard. The Kuwait modern army was established in 1948.

I- Navy Missile Capabilities

- Kuwait's naval capability consists of 10 guided missile boats, 8 of which are Umm Al-Maradim missile attack craft.

II- Air Defense Missile Capabilities

- MIM-104 Patriot 3
- MIM-23 HAWK
- Amoun missile system
- Starburst missiles

III- Air Force Capabilities

- AMRAAM air-to-air missiles

IV- Ground-based Anti-tank Missile Capabilities

- TAU missile system

GCC States and the Deployment of the Iron Dome

There are news of the deployment of the Iron Dome in a number of US bases in the Gulf, with the aim of protecting the Gulf forces against any possible attacks by Iran and its allies. Media outlets say that senior Israeli officials has agreed behind closed doors on the deployment of the Iron Dome and that it's just pending technical approval.

It is argued that a number of Gulf countries are seeking to purchase the Israeli Iron Dome, a short and medium-range anti-missile system, to defend themselves against any possible Iranian aggression. Some sources confirmed that the US firms that participated in the development of the Dome with the Rafael Advanced Defense Systems, including Raytheon, are now in the process of negotiating with Gulf countries to close the deal although no official confirmation from Gulf States has been made yet.

Future Scenarios of the Persian-Gulf Conflict

- 1. Direct Military Confrontation Scenario:** Given the growing conflict between Iran and Gulf States, the idea of a direct military confrontation is broached although it seems unlikely –at least in the short term– for several reasons:

First: Gulf States in general and the KSA in particular do not seek military confrontation. This has been evidenced by statements of Saudi Crown Prince and Defense Minister Mohammad Bin Salman to the Economist in which he noted: “A war between Saudi Arabia and Iran would mark the beginning of a major catastrophe in the region, and it will reflect very strongly on the rest of the world. For sure we will not allow any such thing.”

Second: Iran avoids engaging its forces in war until the last moment. Analyzing Iran’s strategies in handling previous regional conflicts, we find that Iran tend to adopt a “deterrence by doubt” strategy, i.e. as long as the other party is in doubt as to Iran’s conventional and nonconventional military capabilities, this in and of itself remains sufficient for deterrence.

Third: A military confrontation in the Arabian Gulf region will not be considered as a mere regional development given the interests of super powers in the Gulf which may give rise to intervention from these powers. In addition, the interests and positions of regional countries on the Arabian Gulf region, particularly those of Egypt, Turkey, and Pakistan, should be carefully considered. In this vein, mention should be made of President Abdel-Fattah Al-Sisi’s assertion that “the Arab and Gulf national Security is an integral part of Egypt’s national security” as well as statements of the Chief of Army Staff of Pakistan Army in which he said “anyone who thinks of attacking Riyadh must consider the Pakistani response which will confront anyone plotting against Saudi Arabia.”

2. Dialogue and Reconciliation Scenario: Examining the official positions of Gulf States, we find that they weren’t largely opposed to dialogue with Iran. Yet Iran’s hostile policies towards them, which strained relations between the two sides, led those countries to set some prerequisites for dialogue with Iran. So, if we hypothetically assumed that a Persian–Gulf dialogue is possible, three points should be clearly defined:

Ground Rules of the Dialogue: Since the Arabian Gulf region is one of the most important strategic regions in the world, the bilateral dialogue between the GCC states and Iran shall not be disconnected from the overall regional issues (Yemen, Lebanon, Syria, and Iraq) which must be part of this dialogue.

Objectives of the Dialogue: Objectives of the dialogue should be defined so that it isn't a reputation of Iran's contradictory rhetoric. This requires a paradigm shift in Iran's policies toward the Gulf States.

Timescale of the Dialogue: Since Iran always pursues the strategy of "buying time", a clear timeframe for dialogue needs to be set.

3. **Continuation of the status quo (state of tension) Scenario:** Usually, opposing parties may employ several soft and hard tools to confront one another. The effectiveness of these tools is very much dependent on the continuation and severity of regional crises, how these crises can be made use of in the conflict, the developments in the Iranian interior which reflects on Iran's foreign policy, as well as the Russian and US responses towards Iran's regional policies. This scenario is the most likely of the three.

Conclusion

The Persian-Gulf conflict is governed by several factors, including:

There is an extended ideological conflict between Iran and Arab countries. While the facade of states may change, the conflict remains existential and sustained. This persisted even after the establishment of the KSA and the Iranian revolution, particularly after the Gulf States' supported Iraq in the first Gulf War, in which the conflict evolved to include air clashes¹⁰.

The constant Persian-Gulf conflict which takes different shapes –overt or covert– yet is now overt in Syria and.

Iran's success in the negotiations on its nuclear file and steering clear of the United States which makes it close to acquiring a nuclear weapon, particularly after the economic and technological embargo on Iran proved ineffective in preventing it from developing military industries and possessing thousands of ballistic missiles, let alone naval assets.

The paradigm shift in global politics and the US pivot towards China and Southeast Asia to confront the dangers and challenges affecting it economically and militarily.

The Gulf States' pursuit of military balance with Iran, whether by increasing military forces or through alliances. Perhaps this explains the GCC states huge military spending.

Finally, given the various indicators that suggest Iran will likely acquire a more powerful position on the ground over time and the uncertain guarantees alliances could provide, an Israeli–Gulf alliance that goes far beyond the cultural and trade levels can't be ruled out. The unconfirmed talk about deploying the Iron Dome in the Gulf isn't but a forerunner of future developments, the speed of which will be much determined by how quick events unfold in the Gulf States regional setting.

In conclusion, Iran's quest for hegemony over the Arabian Gulf and its littoral states –thus controlling oil flow– is a critical issue that the GCC should think long and hard about and win alliances to ensure no such hegemony takes place. As for world powers, they are subordinate to the United States which currently has no interest in Iran. Even a possible erratic flow of oil (if tensions escalated) will play in the hands of the United States as this will stifle the Chinese economy.

In other words, if Iran guarantees this balance of interests, the West will not have to go to war against it, and the US mobilization that was seen in Operation Desert Shield and Operation Desert Storm will unlikely recur.

References

1. Based on Global Fire Power data of 2020.
2. Andrea Stricker, a researcher on international organizations and Iran nuclear at the Foundation for Defense of Democracies (FDD).
3. Muhammad Al-Saeed Idris, “Dirasa fi usluh a’elaqat al-dawliyah” [Regional Order Analysis: A Study into the Fundamentals of Regional and International Relations], Al-Ahram Center for Political and Strategic Studies (building on David Meyers’ model of regional hegemons).
4. A US magazine focusing on Asia Pacific region, the Middle East, and US policy.
5. There is news of the US pulling the THAAD missile defense system from the KSA
6. The business unit of Airbus and part of the EADS conglomerate. Located in Madrid, the company was established in April 2009 by the integration of the former Military Transport Aircraft Division (MTAD) and Airbus Military Sociedad Limitada (AMSL) into Airbus
7. <https://ar.wikipedia.org/wiki>.
8. Missile Defense Advocacy Website, Bahrain’s Missile Defense Capabilities.
9. According to XAirForces website <https://xairforces.net/army.asp?id=29#.YYEfT-WBBzIV>.
10. The Saudi-Iranian air clash took place on June 5, 1984 during the Iran–Iraq war when two Iranian Air Force F-4 Phantoms entered Saudi airspace to attack merchant shipping but they were intercepted and shot down by two Saudi F-15 Eagles.

Israel's Missile Capabilities

6

STAFF MAJ. GEN. PROF. MOHAMED KASHKOUSH*

STAFF MAJ. GEN. PROF. OSAMA IBRAHIM*

Introduction

Building up and developing the military force take precedence in the Israeli national action, given the circumstances of the emergence of the state of Israel, its survival requirements, and pillars of its national security. This comes in fulfillment of Israel's military doctrine formulated in accordance with the religious affiliation, ideological conviction, and the overall capacity of the state towards maintaining the national interests and fulfilling the security needs in the face of hostilities and national security threats related to areas vital to Israel's security.

For Israel, the military force is a valuable asset of the overall capacity of the state, being a key instrument in protecting national security interests and providing an environment conducive to implementing development plans and achieving prosperity for the Israeli people. The military power

*ADVISORY BOARD MEMBER AT THE EGYPTIAN CENTER FOR STRATEGIC STUDIES (ECSS)

*THE CENTER FOR STRATEGIC STUDIES OF THE ARMED FORCES, NASSER HIGHER MILITARY ACADEMY

is also the flip side of diplomacy in achieving foreign policy goals. Since its inception in 1948, Israel has worked towards establishing an advanced base for the production of strategic deterrence weapons, reflecting various considerations of the Israeli state whether military pertaining to gaining qualitative superiority and possessing deterrent capability sufficient enough for achieving absolute security, or psychological relating to feeling antipathy of Gentiles towards the Jews, or political pertaining to establishing regional hegemony. Further, this missile production program is aimed at supporting Israel's deterrence system, in proportion to the nature of threats that encounter the Israeli security within the near and far security circles (threats from ring countries, the Maghreb in the west, and Pakistan in the east).

From this perspective, Israel managed over the past years to implement several projects that enabled it to possess multiple-range ground-to-ground missiles while designing a program for developing an anti-missile defense system, which saw substantial progress. Israel's missile system is a key component to the achievement of objectives of Israel's deterrence strategy at conventional (i.e. a component of the long-range fire system) and unconventional (i.e. a means for carrying and launching unconventional weapons) levels. Since the end of the 1970s and early 1980s, Israel zeroed in on two components in supporting its missile system: Jericho ballistic missiles; and Shavit satellite launch vehicles.

Depending on its endogenous capacities of military production, joint collaboration with the United States in applied research areas, and the US aid in fulfilling its armament needs under strategic bilateral collaboration agreements between the two sides, Israel's armament development plans have made remarkable progress.

Israel's Ground-to-Ground Ballistic Missiles

Reporting and Capabilities: The Israeli ballistic missile units report directly to the General Staff, being a key component of Israel's deterrence strategy and one of long-range fire systems.

Uses of Israeli Ballistic Missiles: Israeli ballistic missiles are primarily used in bombing vital and strategic targets in enemy states outside the ring countries (e.g. Iran, Libya, Iraq, etc.), if direct hostile intentions are foreseeable, bombarding military targets (command and control cen-

ters, air bases and airports, air defence missile batteries, and the principal concentrations of ground forces) during the early phase of war, as well as bombing vital and strategic targets of the belligerent country during deep operations to gain control over critical national targets and place pressure on the political decision-maker.

Repercussions of Israel's Possession of Ballistic Missiles

Israel's possession of ballistic missiles reflects on the continuity of the military power imbalance in favor of Israel, amid prevalence of "double standards" policy pursued by international powers, as is demonstrated by sticking to applying guidelines of the Missile Technology Control Regime (MCTR) on countries in the region except Israel. Further, it increases Israel's potential in threatening the Arab and Islamic countries into the deep and opening gaps in their air defense system at a lower cost instead of using the air forces while reducing the Arab forces' opportunities of using the ballistic missiles against the Israeli targets during deep operations.

Israel's Justifications for Using Ground-to-Ground Missiles

Israel justifies its possession of the ground-to-ground missiles by the need to hit the economic and military targets that affect strategic support operations, protect Israeli pilots against air defense elements who cover and protect the deep strategic and tactical targets, and ensure ability to execute against strategic and tactical targets.

Development of the Israeli Missile Capabilities

Ground-to-ground missiles are a key component in achieving objectives of the deterrence strategy at the conventional (i.e. a component of the long-range fire system) and unconventional (i.e. a means for carrying and launching unconventional weapons) levels.

Jericho Missiles

Since the 1960s, Israel has been taking an interest in developing ballistic missiles. In this vein, it sponsored research projects for the production of ballistic missiles through joint collaboration between Israel Aerospace Industries (IAI) and the French aerospace company Dassault, where an

agreement for a “Ballistic Missiles Project” was signed on 26 April 1963. The production of ballistic missiles under this agreement started in May 1964 and continued until January 1969, where 25 MD-620 missiles were manufactured, of which five had a single-stage configuration and twenty were two-stages.

Later, Israel adopted a national program for the production of Jericho missiles (Jericho was a general designation given to the Israeli ballistic missiles in 1963. The name derives from that of Jericho city where, according to the Bible, a major massacre took place). Jericho missiles were developed with ranges of up to 6500–7000 km. In addition, there have been projects for the production of the Shavit missiles that launch satellites. Historically, the development of the Jericho missiles has gone through three main stages identified as follows:

- Jericho I was developed in Israel under a mantle of secrecy. The range cap of the missile has been subject to multiple revisions but no details about this were published until its range reached 500 km. At the time of development, Jericho I was considered a short-range ballistic missile system. It was used in late 1971. Until 1980, the project was believed to have produced about 100 missiles.
- Jericho II was a refinement of Jericho I. Development of Jericho II began during the early 1980s. It is a solid-fueled two- stages missile. It was test fired in the period between 1987 and 1992 in the Mediterranean, and its range was developed to 1300 km.
- Jericho III is the most developed version of the Jericho missiles and was intended to replace Jericho II. It is a three-stage missile and is presumed to have entered service since mid-2005. Jericho III has an estimated range of 6500–7000 m.

Israel's Missile Defense System (Missile Shield)

Within the framework of its strategic cooperation with the United States, Israel has espoused a program to build up an anti-missile defense system. To that end, it signed an agreement that allowed its participation in the Strategic Defense Initiative (SDI) research where the United States and Israel co-developed different versions of the Arrow anti-ballistic missile. Further, Israel came to be included under the Theatre Missile Defense (TMD) systems which aim at protecting the US allies from local threats

While Israel calls for international action against Iran's nuclear program, it possesses one of the world's most advanced multi-tiered missile defense systems, designed to protect it from simultaneous missile attacks. The project is US-funded and makes use of advanced US radars and technologies. Israel's missile defense system is now grown to maturity and could alter the nature of strategic decisions in the region.

Israel's anti-missile defense system comprises the US Patriot PAC-2 and Arrow 2 /Arrow 3, the Israeli Hetz 2 defense system already deployed and is being upgraded to include Hetz 3 (a long-range variant of Hetz 2), David's Sling defense system designed to knock out low-altitude slow-speed missiles, and the Iron Dome designed to shoot down Grad, Katyusha, and Qassam rockets, among other missiles. Such a defense system is likely to ensure security stability for Israel.

Since January 1997, Israel has been benefiting from the US Air Force Space Command-operated Defense Support Program (DSP). Concomitantly, it started a project for the production of the Hetz missile system with a range of up to 70 km and an altitude of 40 km, two batteries of which entered service in 1999. A third artillery battery was supposed to be developed but was reconsidered after it failed to intercept a ground-to-ground Scud-D missile during the Iraq war (it was test fired 26 August 2004 in California). Further, Israel procured the US Patriot missile system with a range of up to 70 km and an altitude of 25 km, designed to shoot down traditional atmospheric targets (aircraft) as well as the Pac-3 anti-ballistic missile system.

The Iron Dome Missile System

The establishment of the Iron Dome was motivated by Israel's need for a defense system to protect itself from short-range rockets, particularly following the 2006 Lebanon War in which Hezbollah fired more than 4,000 short-range Katyusha rockets on northern Israel, resulting in the murder of 44 Israelis, along with Hamas' and other Palestinian factions' continued rocket launch at Israel where 8000 rockets were fired into Israel from the Gaza Strip.

In February 2007, Israeli Defense Minister Amir Peretz settled on the Iron Dome system as a defensive solution to lift the short-range missile threats. Since then, the \$210 million system has been co-jointly developed by Rafael Advanced Defense Systems and the Israeli Defense Army and entered service in mid-2011.

The Iron Dome is a mobile air defense system, designed to intercept short-range rockets and artillery shells. It operates by tracking incoming short-range projectiles through radars, then the battle management and control system (BMC) analyzes the reported data to determine whether the target constitutes a threat to the designated area. If a threat is detected, an interceptor missile is fired to destroy the incoming rocket before it reaches the predicted area. Each battery is armed with a detection and tracking radar, a missile firing unit (MFU), and three launchers, each carrying 20 interceptors.

Air Defense Missiles

The Israeli Defense Forces work regularly on strengthening the early warning and fire capabilities of air defense forces, particularly those of the air defense elements supporting ground units that protect and secure vital and strategic targets through using air defense missile systems, including the Hawk, Vulkan, Chaparral, and Machbet, man-portable missiles such as Stinger and Red Eye, besides several missile shield systems and surface-to-surface missiles.

FIM-43 RedEye

Type	: Short-range anti-aircraft missile
Place of Origin	: United States
Usage	: Man portable , watches over low to medium aerial targets
Engagement Range	: 500-5500 m
Maximum Altitude	: 2700 m
Warhead Weight	: 2 kg explosive
Maximum Speed	: Mach 1.6



Stinger

Type	: Low-altitude anti-aircraft missile
Place of Origin	: United States
Usage	: Man portable, watches over low to medium aerial targets
Engagement Range	: 200–4500 m
Maximum Altitude	: 3800 m
Warhead Weight	: 3 kg explosive
Maximum Speed	: Mach 2.2



Chaparral

Type	: Mobile Low-altitude missile system
Place of Origin	: United States
Launcher	: Self-propelled, carries four ready-to-fire missiles
Firing Rate	: 4 missiles/ min
Engagement Range	: 500–9000 m
Maximum Altitude	: 15–3000 m
Warhead Weight	: 12.6 kg blast fragmentation
Maximum Speed	: Mach 1



Hawk

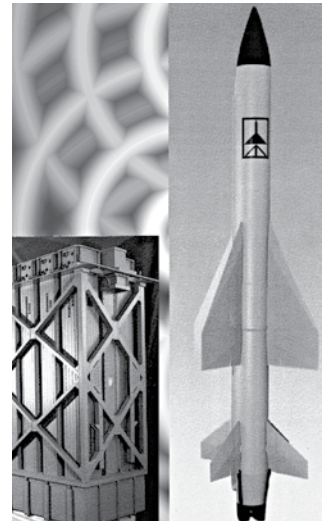
Type	:	Medium-range surface-to-air missile system
Place of Origin	:	United States
Launcher	:	Towed triple-missile launcher
Effective Range	:	2-32 km
Effective Firing Altitude	:	60m-13.7km
Warhead Weight	:	45kg blast fragmentation



Barak-1

Type	:	Medium-range air defense system
Place of Origin	:	Israel
Diameter	:	17 cm
Length	:	217.5 cm
Weight	:	86 kg
Operational Range	:	10-12 km
Warhead Weight	:	22 kg
Maximum Range	:	10 km

Its C3I radar can detect and take down missiles flying at 2 Mach and having a diameter of not more than 10 cm up to a range of 20 km. Barak-1 can track 20 targets simultaneously and target the most threatening ones.



Machbet

Type : Short-range air defense system

Place of Origin : Israel

Armament : 20 mm Vulcan rotary cannon, 4 modified Stinger missiles, and an infrared guidance unit. The system is carried on a tracked armored personnel carrier, M-113.



The system has a GPS. The guidance unit is linked to a computer that estimates the target's distance and direction.

Patriot

Type : Anti-ballistic tactical missile system

Place of Origin : United States

Launcher : Towed four-missile launcher

Operational Range : 3-80 km

Height : 60 m - 25 km

Maximum Speed : Mach 3.7

Propellant : Single stage solid-fueled propellant



Hetz (Arrow)

Type	:	Anti-ballistic missile
Place of Origin	:	Israel/ United States
Operational Range	:	90 km
Operational Altitude	:	10 - 40 km
Radar Range	:	100 km approx
Propellant	:	Two stage solid-fueled propellant



Air Force Missiles

The Israeli Air Force gives targeted attention to aircraft armament systems, and possesses a wide range of aircraft ancillary equipment, either US- or Israeli-made including radar, infrared and laser air-to-surface guided bombs and missiles such as Standard ARM, HARM, Shrike, Maverick, Gabriel, Popeye, Ophir, GBU 15/28, and BP500; radar and infrared air-to-air guided missiles including Sparrow, Sidewinder, Shafrir, Python 3, Python 4, and AMRAAM, Derby extended-range (60 km) air-to-air missile that can be integrated into a variety of fighter aircraft such as F-15 and F-16 to carry out attack missions beyond visual range, and air-to-surface Popeye Turbo missile that can be integrated into F-15 and F-16 fighters to carry out long-range air strikes (>200 km) against sensitive targets beyond the detection range of hostile radars.

F-15

- Type : Tactical fighter aircraft
- Arma- : Carries 20 mm 6-barrel rotary
ment : cannon, plus various air-to-air
and air-to-surface, including
Sparrow and Sidewinder.

Super Phantom

- Type : Tactical fighter aircraft
- Arma- : Carries 20 mm 6-barrel rotary
ment : cannon, as well as various
air-to-air and air-to-surface
missiles and bombs.

F-15 I

- Type : Air superiority fighter
- Arma- : Carries 20 mm 6-barrel
ment : rotary cannon, plus various
air-to-air and air-to-surface,
including Sparrow and Side-
winder.

F-16

Type : Multirole fighter, air superiority fighter

Armament : Armed with various types of guided and conventional air-to-air and air-to-ground missiles.

Cobra

Type : Attack helicopter

Armament : 20 mm 3-barrel rotary cannon, fire 2.75-inch rockets, and 8 anti-tank guided missiles.

Apache

Type : Attack helicopter, attack and combat missions

Armament : 30 mm rotary cannon, 16 anti-tank guided missile (Hellfire), unguided air-to-air air-to-ground guided missiles.

Black Hawk

Type : Utility helicopter

Armament : Can carry 16 Hellfire missiles
or various unguided and guided
armaments.

Bell 212

Type : Medium utility helicopter

Armament : 2×7.62mm machine guns and
2× 40mm grenade launchers
or 2×7 2.75 inch rockets.

Machatz (IAI Heron)

Type : Medium-altitude long-endurance un-
manned aerial vehicle (UAV)

Place of Origin : Israel

Development : Israel seeks to use the Machatz in in-
tercepting ballistic missiles by arming it
with advanced air-to-air missiles known
as Missile Optimized Anti-Ballistic
Missile System (Moab) and using it to
launch ballistic missiles with an inter-
ception range of 5-7 km.

Hermes 1500

Type	: Long-altitude UAV
Place of Origin	: Israel
Payload	: 400 - 600 kg It has a CCD TV camera, infrared camera, real-time data link means, internal GPS, encrypted communications system, and an autopilot system. Carries air-to-air armaments.

Navy Missiles

The Israeli Navy strives to provide its units with various multi-range missiles, enabling them to carry out their missions at high efficiency. As such, all navy units were equipped with Harpoon and Gabriel-II missiles, the latter is reportedly being developed to give rise to Gabriel-IV with a claimed range of 200km. Israel is also introducing modifications to the air-to-ground Bob Eye missile to be integrated into the Dolphin-class submarines.

Dolphin-Class Submarine

Type	: Diesel-electric submarine
Place of Origin	: Germany
Armament	: Fitted with 10×533 mm torpedo tubes, 14 torpedoes each and can be used for launching Harpoon cruise missiles.

Sa'ar 5-Class Corvette

Type : Sa'ar 5-class corvette
 Place of Origin : Israel
 Maximum Range : 4500 mls

Armament : Fitted with 8 Harpoon missile launchers with a range of 130 km, 8 Gabriel missile launchers with a range of 36 km, 2×32-cell vertical launch system battery of 64 Barak 1 surface-to-air missiles, Phalanx close-in weapon system (CIWS), 2× 25 mm Sea Vulcan cannons, and 6× MK-32 Torpedo launch tubes, and an electro-optic surveillance system.

Sa'ar 4.5-Class

Type : Missile Boat Sa'ar
 4.5-Class
 Place of Origin : Israel
 Maximum Range : 3000 nautical miles at
 17 knots.

Armament : Fitted with 8 Harpoon missile launchers with a range of 130 km, 6 Gabriel missile launchers with a range of 36 km, 76 mm OTO Melara gun with a range of 16km, 3×20 mm Oerlikon cannons with a range of 2km, 20 mm Phalanx CIWS, and 4 surface-to-air missiles Barak 1 with a total of 32 missiles.

Dvora-Class Missile Craft

Type	:	Missile Craft
Place of Origin	:	Israel
Maximum Range	:	700 nautical miles at 27 knots
Armament	:	Two Gabriel missiles with a range of 36 km, a 20 mm cannon with a range of 1,500 m, and a 12.7 mm machine gun.

Ground Forces Missiles

The Israeli ground forces carry out preventive and preemptive attacks by relying on agile ground troops armed with a wide range of bunker busters, armored vehicles, and advanced surface-to-surface missile systems.

Lar-160 Rocket Artillery

Type	:	Multiple rocket launcher on a mobile platform
Place of Origin	:	Israel
Caliber	:	160 mm
Operational Range	:	30 Km
Vehicle	:	The chassis of the tank mount- ing the modular launcher are of the models M-47, M-48, M-809, and M-508.

MAR-290 Rocket Artillery

Type	: Self-propelled multiple rocket launcher on a mobile platform
Place of Origin	: Israel
Caliber	: 290 mm
Operational Range	: 40 Km
Direction	: 360 °
Altitude	: 0-60 °
Vehicle	: Sherman chassis

MLRS Rocket Artillery

Type	: Self-propelled ground-to-ground multiple launch rocket system
Place of Origin	: Multiple
Caliber	: 227 mm
Maximum Speed	: 64 km/h
Rocket Range	: 30 - 70 km
Rocket Weight	: 258 kg

MAPATS

Type	:	Anti-tank guided missile
Place of Origin	:	Israel
Calibre	:	148 mm
Maximum Range	:	5 km
Total weight	:	66 kg
Warhead Weight	:	3.4 kg
Penetration	:	80 cm rolled homogeneous armor (RHA)
Guidance	:	Laser-beam riding

Spike Family Rockets

Type: Anti-Tank Rocket

Model	Range	Guidance System	Launch
Small Spike (GILL)	2.5 km	Self-guidance [Fire and Forget]	Man-portable or mobile platform
Spike	4 Km	Optical	Man-portable or mobile platform
Long Spike (NTD)	6 km	Optical	Helicopter-launched

Improved TOW Missile (ITOW)

Type	: Anti-Tank guided missile
Place of Origin	: United States
Caliber	: 152 mm
Maximum Range	: 3.75 km
Total Weight	: 25.7 kg
Penetration	: 80 cm RHA
Missile Guidance	: Wire-guided

TOW-2B

Type	: Anti-Tank guided missile
Place of Origin	: United States
Length	: 1.168 m
Maximum Range	: 65-3750 m
Total Weight	: 22.6 kg
Warheads	: 2
Capability	: Top Attack

Ground-to-surface missiles

Jericho I

Type	: Self-propelled ground-to-ground tactical missile
Place of Origin	: Israel
Maximum Range	: 500 km
Warhead Weight	: 500 kg
Guidance	: Inertial guidance

Jericho II

Type	:	Self-propelled ground-to-ground tactical missile
Place of Origin	:	Israel
Peak	:	1,500 km
Missile Guidance	:	Inertial guidance
Development	:	Is a refinement of Jericho 1 with a range of up to 1,500 km and is expected to be replaced by Jericho-3 with a target range of 2,000 km.

Lance

Type	:	Tactical ground-to-ground self-propelled ballistic missile
Place of Origin	:	United States
Maximum Range	:	75 Km
Warhead Weight	:	270 kg
Guidance	:	Inertial guidance

Conclusion

Since its creation, Israel has fastened on developing its nuclear capabilities secretly and managed later to produce nuclear weapons on which it kept a lid at times or publicized at others for purposes of deterrence by doubt. To make up for the weak conventional arms capabilities and the geostrategic fragility in the face of the surrounding Arab antipathy, Israel takes precedence in developing nonconventional missile systems so as to be able to use them without the need for launching high-cost aircraft operations or endangering pilots. In this vein, Israel hasn't lost sight of the missile armament of all branches of the IAFs. This was added by the major development of the Israeli military industries and Israel's collaboration with technologically advanced countries, particularly the United States and France. The Israeli missiles were a great asset to the space sector as well where missiles were used to launch military as well as nonmilitary satellites, whether for intelligence or communication purposes, much less high-precision smart missiles capable of shooting down enemy targets at high precision.

Turkey's Missile Capabilities

7

STAFF MAJ. GEN. PROF. WAEL RABIE*

MOHAMMAD HASSAN*

Turkey has a unique geographical location, situated at the crossroads of the Caucasus, Balkans, and the Middle East. These three regions constitute, in their entirety, Turkey's vital space in which it exercises its foreign policy. Within this vital space, there exist threats that –according to Turkey– put its national security at risk, along with Turkey's ambitions in the Middle East, notably keeping a firm hand on the Eastern Mediterranean gas and reviving the Ottoman Empire in what was coined “neo-Ottomanism”.

After 2010, several international and regional transformations gave rise to conflicts inside Turkey and tensions in its foreign relations, particularly with the European Union (EU) and the United States for its military role in Iraq, Syria, and Libya, conflict with Kurds, disputes in the Mediterranean particularly over gas, and the tension an EU country, Cyprus. All of these factors led to growing rifts between Turkey and the United States and EU, opening the door to sanctions and embargos on arms'

*ADVISOR TO CENTER FOR STRATEGIC STUDIES AT NASSER HIGHER MILITARY ACADEMY

*RESEARCHER AT THE EGYPTIAN CENTER FOR STRATEGIC STUDIES (ECSS)

sales to Turkey, which had a negative impact on the Turkish defense industries and armament contracts.

The US and EU sanctions on Turkey, which included imposing an embargo on western arms' sales to Turkey, pushed Turkey towards adopting a national strategy aimed at developing a competitive defense industries' infrastructure. This has been evidenced by the presidential decree of 10 July 2018 that embodied Erdogan's desire to expand and develop the national arms industry. The decree established that the Defense industry of Turkey be managed by the Presidency, through a civil institution named "Presidency of Defense Industries".

Between 2010 and 2020, the Turkish defense industry flourished remarkably. In 2010, only one Turkish company was included on the world's top 100 defense companies list. At present, Turkey has seven companies on the list, topping Israel, Russia, Sweden, and Japan altogether. Turkey's share of arms imports declined by 48 percent from 2015 to 2019, bringing a decrease in military hardware imports from 70 percent to 30 percent.

Concomitantly, the volume of Turkey's arms exports grew from \$1 billion in 2002 to \$11 billion in 2020, leading Turkey to become the 14th largest global defense exporter. Turkey invested \$60 billion in defense projects and it is one of only twenty-two states manufacturing armed drones, which adds another dimension to its regional military potential.

Despite the significant development of the Turkish defense industries that placed Turkey among the 15th largest arms exporters, the Turkish missile industry remained a subject of much controversy, being the weakest component in the Turkish arsenal, when compared with the air and naval industries that witnessed substantial development, causing Turkey's exports of defense and aerospace products to rise to \$950 million in the first quarter of 2021, an increase of 47.7 percent from the corresponding period in 2020

Notwithstanding this weakest link in the chain of Turkey's defense industries, Turkey managed to develop its missile arsenal starting from ballistic missile systems to rocket artillery to naval and aerial munitions, towards meeting the defense needs imposed by the geopolitical circumstances surrounding Turkey and fulfilling Ankara's ambition of expanding and playing greater political roles in the region, let alone its Blue Homeland strategy to exert influence in land and sea. Given this setting, Turkey's missile capabilities were brought into sharp focus once again. Below we review Turkey's missile arsenal and its development bases.

I- Rocket Artillery

Turkey holds multi-range rocket artillery system that if, considered against missile artilleries of neighboring countries, and given its medium range and limited firepower, can be described as being modest. That said, Turkish defense companies continue to develop and produce various types of artillery that keep pace with the tactical missions of the Turkish army and help support the ground forces. Notable examples of Turkey's self-propelled rocket artillery include the following:

TR-107 Sakarya

TR-107 Sakarya was Roketsan's first improvised rocket system developed in 1999. It is a variant of the BM-21 rocket, developed with an additional control and fire unit with a range of 40 km.

The new generation of TR-107 Sakarya which can fire 122-mm rockets was developed jointly with South Korean specialists, and is equipped with a laser guidance system that allows for hitting fixed and moving targets at high precision. The system makes use of a state-of-the-art digital fire control system, which can store up to 20 target coordinates.

TR-300

TR-300 is a Turkish artillery rocket developed by Roketsan to suppress targets at a range of up to 100 km. Reportedly, TR-300 rockets were used in the Battle of Idlib. TR-300 has been modified recently to TRGK-300, a further evolution featuring a GPS/INS guidance system and an extended range of 12 km. These rockets are among the most important artillery rockets to engage critical targets with a very high combat capability, thanks to its powerful warhead with a radius of 70 meters and a range of more than 100 km.

T-300 Kasirga Multiple Launcher

T-300 Kasirga entered service with the Turkish Army in 2000. Typical battery of the Kasirga includes 6-9 launcher vehicles, resupply vehicles, and a command post vehicle. All of these vehicles are based on the German MAN 6x6 tactical truck chassis.

This system is used to engage priority targets with guided rockets at

ranges up to 90-120 km. Hostile artillery batteries and air defense systems, command posts, radar sites, logistical facilities, assembly areas, and other high priority targets are all typical targets for this system.

The Kasirga uses TR-300 series artillery rockets, 320 mm in diameter –though these are sometimes referred as 300 mm. There are unguided TR-300S rockets with a maximum range of up to 65 km and TR-300E rockets with a maximum range of up to 100 km.

Kaplan (Tiger) is a further evolution of the Kasirga. It has rearranged launch tubes, i.e. a multi-caliber system. That is why Kaplan is referred to as the Multi-Caliber Launcher. It can carry pods with 122 mm, 230 mm, and 302 mm rockets and Bora Khan short-range ballistic missiles.

II- Ground-to-Ground Ballistic Missiles

J-600T Yıldırım

J-600T Yıldırım is a short-range ballistic missile that provides high mobility. Its design is based on the Chinese B-611 ballistic missile and its launch platform is based on the MAN 26.

J-600T Yıldırım is designed to attack high-value targets such as enemy air defense installations, Command, Control, Communications and intelligence (C3I) centers, logistics and infrastructure facilities and provide fire support to artillery by expanding the area of effect. Four versions of J-600T Yıldırım were produced, namely Yıldırım I with a range of 150 km, Yıldırım II with a range of 300 km, Yıldırım III with a range of 900 km, and Yıldırım IV (in development) with a range of 2500 km.

Bora Khan

Bora (Khan) ballistic missile entered service in 2017 and was first used in Syria in 2019. It weighs 2500 kg and has a diameter of 610 mm, a warhead of 470 kg, and a range of more than 280 km. Bora is an all-weather all-terrain missile with high firepower.

It can be fired from a launcher mounted on an 8×8 tactical vehicle or from a Multipurpose Missile System that is operated by three-crew members.

Roketsan is planned to develop two other versions of Bora, the first with a range of 1400 km and the second (under development) with a range of up to 2500 km.

III- Air Defense Missile Capabilities

At large, Turkey's air defense system suffers major weaknesses. Turkey used to rely on the NATO Integrated Air Defense System, under the United States command, which deployed several Patriot batteries in a number of European countries, including Turkey, Germany, and Italy.

However, after the shooting down of a Russian fighter by a Turkish military aircraft in the Turkey-Syria border area by the end of 2015 and following Turkey's entering into a political-military crisis with Moscow, the NATO opted to withdraw one of the Patriot batteries deployed in Turkey, which enraged the Turkish government and gave rise to an internal debate over Turkey's need to have air protection that doesn't fall under the NATO command, with the ultimate aim of securing the Turkish lands exposed to increased threats from abroad, sending a powerful message to the NATO of Turkey's possessing other options to secure its national security away from the pressures of allies.

As such, in 2017, Turkey concluded a deal with Russia for the purchase of S-400 missiles. In July 2018, Turkey delivered the first four missile batteries worth \$2.5 billion, but it has never been able to fully bring it into service due to pressures from the US and NATO. The Secretary General of NATO, Jens Stoltenberg, expressed NATO's refusal of possession of the S-400 missile defense system by any NATO member. In a press conference following the conclusion of the October 2021 Meeting of NATO Ministers of Defense, Stoltenberg stated that the NATO doesn't accept that a member state possesses the Russian S-400 missile defense system.", in reference to Turkey which faces calls from several international actors to abandon the S-400 deal, on the grounds that it is not interoperable with the NATO defense systems.

By comparison, S-400 has the ability to destroy air targets at a range of 250 km and ballistic missiles at a range of 60 km while the Patriot can suppress air targets at a range of 160 km and missiles at a range of 45 km. Additionally, the S-400 can shoot down targets at altitudes ranging from

10 meters up to 27 km, its radar covers a circle with a diameter of 600 km, and it can be deployed within 5 minutes.

Air defense missiles (Hisar):

Through the Rokestan and Aselsan companies, the Turkish defense industry began to develop a short-range, Turkish-made air defense system called the Hisar, which has been under development since 2007. The system passed final tests in October 2019, and the Hisar-A and Hisar-O classes have been in service since 2020 and 2021, respectively.

Hisar-A has a range of 2 to 15 kilometers, whereas Hisar-O has a range of 3 to 5 kilometers. The Hisar-O missile system uses infrared guidance. The third class, Hisar-U SIPER, with a range of 15 to 30 kilometers, is still being tested. Additionally, it will be used against fixed-wing aircraft, as well as unmanned aerial vehicles (UAVs-Drones), to protect military bases, ports, and facilities from aerial threats.

In addition to surface-to-air missiles, Rokestan also manufactures directed-energy weapons, which are long-range weapons that use laser rays and microwaves as focused energy to destroy military targets such as soldiers, vehicles, and equipment. Furthermore, they are occasionally employed to interfere with radar and communications systems, leading them to fail; its models range from 500 m to 4,000 m.

IV- Naval missiles:

Turkey seeks to develop a regional naval force that will allow it to carry out long-range missions independent of NATO. To accomplish this, Turkey has updated its naval fleet with six advanced submarines scheduled to be completed by 2025, giving the Turkish Navy a total of 12-14 modern submarines, giving it a significant advantage against Israel. Furthermore, it is developing multi-purpose frigates and cruisers that will be armed with the Atmaca missile, which is similar to the American Harpoon missile. The Turkish Navy is seeking to enhance its amphibious strike force and naval capability on several fronts by constructing Anadolu, a potentially small aircraft carrier attack ship that will provide Turkey with unprecedented offensive capabilities in the Black Sea and the eastern Mediterranean.

Atmaca Navy Missile

In June 2021, Turkish President Recep Tayyip Erdogan announced the successful testing of the Atmaca anti-ship missile, in its final test before it was added to the Turkish Armed Forces arsenal. “The locally-made rocket was able to hit its target,” Erdogan remarked, noting that for the first time, a ship was chosen as a target for the Atmaca missile, resulting in a complete hit.

Atmaca means “Falcon” in Turkish, and it is the first Turkish naval cruise missile created by the Turkish defense industry company Roketsan. Furthermore, the missile, which has a range of 200 kilometers and is nicknamed the “Steel Sword of the Blue Homeland,” will help to reduce the employment of US Harpoon missiles.

The Ghost Submarine Sida

It’s a mechanically-operated submarine; the first of its kind in the world, capable of detonating submarines, ships, and aircraft carriers by operating with an electric magnet system, sticking to the bottom of the target or aircraft carriers, and detonating it. Moreover, it’s controlled under the sea, via whale and dolphin-like sound waves, and commenced service from 2019.

The Sida stealth submarine can cruise nonstop in the sea for 12 hours and can stay ready on the seabed for 240 hours.

Furthermore, Turkey is developing the defense anti-torpedoes Tokar missiles, which are anticipated to be one of the most important underwater weapons in the near future.

V- Air Force Missile Systems

SOM-J missiles

The Stand-off Missile (SOM) is the first Turkish accurate long-range cruise missile designed and developed jointly by the TUBITAK Defense Industries Research and Development Institute (TUBITAK SAGE) and the Roketsan Missile Manufacturing Company of the Republic of Turkey.

In October 2014, Turkish Defense Industries signed an agreement to develop a new generation of SOM-J cruise missiles with the American Lockheed Martin, to be used with the fifth-generation F-35 multifunctional stealth fighter, or on other aircraft. The existing missile was displayed at the International Defense Exhibition and Conference (IDEX 2015), held in Abu Dhabi, United Arab Emirates.

The missile weighs 600 kilograms and is equipped with a filler of 230 kg, carrying a double-phase tandem penetrating warhead. It has very precise target effect sensors in guidance and navigation. The SOM missile was equipped with an infrared research system (IIR) and an inertial measurement unit (IMU) for high accuracy guidance.

VI- Directed Unmanned Aerial Vehicles (Drones)

Turkey has developed its capabilities in the areas of design, production, modernization, modification, and integration of drone-guided and satellite systems by the Turkish Aerospace Industries, as well as developing national products that meet the necessary requirements of the Turkish Armed Forces. Additionally, it has manufactured the Phoenix unmanned aircraft, which had its first flight in December 2010, and commenced Air Force service in April 2013, before launching its first strike on 12 July 2017, where it assassinated five members of the Kurdistan Workers' Party in eastern Anatolia.

As relations with the West remain strained as a result of Turkey's intervention in many areas of conflict, Turkey has focused on developing its defense equipment, most notably modern drones such as the Bayraktar TB2 and the Akinci aircraft, which Turkey has begun to use in its army and counts as an addition to military capabilities, particularly in reconnaissance and aerial bombardment of military combat activities in areas of tension in Iraq and Syria, and have also been used in Turkish operations in Libya. Guided aircraft are cost-effective systems that reduce human losses and prices, as well as delivering valuable export assets.

One of the reasons for Turkey's move towards the manufacture and production of guided aircraft was that it was hiring aircraft from the United States and Israel to pursue the PKK organization, but it was revealed that when America or Israel leased these aircraft to it, they were heavily interfering in the operation of the aircraft, preventing the Turks from achieving their goals. Turkey is now the world's third-largest manufacturer of such systems.

Drone Missiles

Rokestan completed the development of the Smart Micro Munition (MAM) in 2016 to fulfill the demands of Turkish armed guided aircraft over battlefields. Turkish unmanned aerial vehicles (UAVs) have played a significant part in changing the rules of the game in Syria, Iraq, and, more recently, Nagorno-Karabakh and Libya, by deploying Rokestan's smart MAM-L and MAM-C smart micro munitions while destroying their targets.

There are two versions of MAM-L; the first of which is the laser-researcher head-supported, inertial-guided version, which is heavily used in operations. The second version is supported by GPS and the Integrated Inertial Navigation System.

The GPS and the inertial navigation system-supported version can only target static targets, while the other version can strike both stationary and moving targets. The company produces three different models, which are: MAM-C with a range of up to 8 km, MAM-L with a range of 14 km, greater destructive capacity, and MAM-T with a range of over 30 km and a major destructive force.

VII- Satellites

When talking about missile capabilities in all areas of land, sea, and air uses, space capabilities must also be talked about, due to its close association with the guidance of some long-range missiles, as well as guided drones. To elaborate, the link includes the supply and reception of information, protection against interference, and, most crucially, guidance.

Turkey currently has six active satellites; three for communications and three for reconnaissance. Moreover, Turkey launched its first satellite on August 10, 1994.

In January 2021, the Turksat 5A satellite, a fifth-generation satellite, was launched. Ankara's Turksat 5A launch seeks to reach all areas from the Turkish Republics to China in Asia, as well as Africa and Europe, meaning that millions of people around the world will be able to connect via Turkish satellites. Turkey is reportedly building the newest generation of Turksat 6 on its own, as part of its aim to send the first entirely domestically manufactured satellite into space by 2022.

In conclusion, international and regional changes -- in particular tensions with the European States and the United States of America, the drastic technological development of the armament systems of Turkey's geographical neighbors, and the threats to Turkey have placed particular importance on the Turkish leadership's self-sufficiency orientation in arming the Turkish army by relying on Turkish defense industries to provide for all the needs of the army. Moreover, these include armored vehicles, tanks, naval units, ammunition, and missiles, which are required to achieve high firepower and to introduce "remote combat" technology against threats in the immediate and distant dimensions. This trend confirms the connotations of the monitoring and analysis of Turkish defense industry activities already addressed in this paper.

Aside from the strength of Turkey's weaponry system and its strong reliance on war manufacture, the country lacks a competent air defense system to deal with aircraft intrusions and the threat of missile assaults from its unstable surroundings.

Despite claims about Turkey's military capabilities and defense industry superiority, the country continues to rely on the West for critical components of weaponry systems utilized by the Turkish army and exported overseas. For example, the whole Turkish air force relies on aircraft constructed in the United States or flies with parts supplied by the United States. At the same time, more than half of the tank weapons and half of the Navy's battle fleet are built in the United States, with the remainder originating from Germany.

This emerged during the crisis in Turkish-European relations and with the United States of America, where Europe and America imposed restrictions on the supply of certain complementary machines and equipment used by Turkey in its military industries. Additionally, Washington has also halted the supply of the F-35 aircraft to Turkey, most notably in this context:

The United States suspended the export of the CTS-800A, a turboshaft engine for the Turkish-manufactured armed helicopter (T129 ATAK), which led to the suspension of a \$1.5 billion export contract signed between Turkey and Pakistan in 2018 aimed at exporting 30 attack helicopters.

Germany has suspended the export of Turkish-manufactured “Altay” tank engines, the world’s most expensive war tank, which is sold at \$13.75 million. Consequently, this led to delays in the implementation of a billion-dollar underlying contract for Qatar to purchase 100 “Altay” tanks from Turkey, in a deal that could be one of the largest arms export deals the Turkish defense industry has known in decades.

Ukraine’s reluctance to exchange military technology with Turkey, related to the Ukrainian AAI- 450 turboshaft engines on which Turkey relies for the production of the “Akinci” marching aircraft, which will play an essential role in maintaining the operational capability of the Air Force, stems from general concerns about technological and intellectual property rights.

The restrictions imposed by both the United States and Germany on Turkey acquire approval from one of the two countries before exporting any Turkish weapons in which one of them is involved, whether with expertise or equipment.

Egypt's Satellite & Missile Capabilities

8

STAFF MAJ. GEN. PROF. AYMAN FAWZI ABDEL-HAFEZ*

Egypt was the first country in Africa and the Middle East to begin fundamental space science research in 1905, when a 30-inch telescope at Helwan Observatory was used to monitor and track space. In the 1960s, things developed significantly and Egypt began tracking satellites using telescopes and photographic cameras, as well as high-resolution lasers at the Helwan Observatory in collaboration with the Czech Republic.

Egyptian efforts in space sciences were made between the 1960s and 1990s of the previous century. They can be considered a precursor to the onset of satellite industrialisation, which began in earnest in 1998. Egypt, for example, was one of the first African and Middle Eastern countries to adopt remote sensing for national projects. Following that, the Remote Sensing Centre at the Scientific Research Academy was established in 1972, which eventually became the National Authority for Remote Sensing and Space Sciences (NARSS). Egypt also aspires to be a regional hub for satellites and space through a variety of foreign and internal programs.

In August 2016, the first Egyptian program to establish an Egyptian space agency was launched. The Egyptian Space Agency and the Space

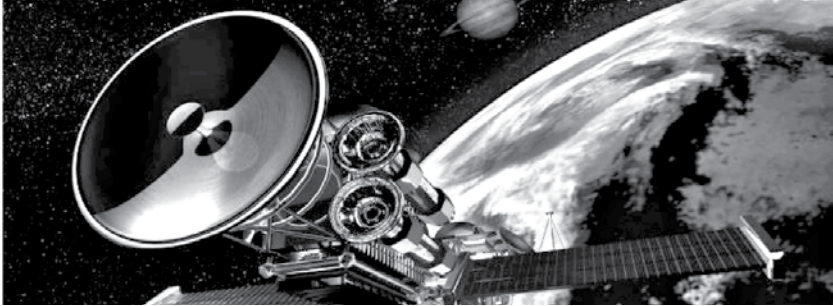
*ADVISOR TO CENTER FOR STRATEGIC STUDIES OF THE ARMED FORCES

Science City are in charge of determining Egypt's space strategies and establishing the infrastructure needed to manufacture satellites for sensing and communication. An academy for space sciences, a satellite assembly centre, and a centre for receiving and processing satellite images are all part of the program. On January 15, 2017, the National Research Institute of Astronomy and Geophysics (NRIAG) was able to make groundbreaking astronomical findings, including the detection of the change of (6) stars through the Kottamia Astronomical Observatory, in a precedent that is the first of its kind. These stars were named after Egypt and the Kottamia Telescope and were recorded on the website of the American Association of Variable Star Observers (AAVSO). The importance of this finding is in knowing more about the physical, engineering, and chemical features of this type of star, whose presence in the cosmos is believed to be more than (80%). It also paves the way for a slew of research to be conducted to measure the distance and physical environment around such stars and compare them to the sun.

In April 2017, the Egyptian Ministry of Defence held the 17th International Conference on Aerospace Sciences and Aviation Technology. The Conference discussed (99) scientific papers in many important pieces of research that shed light on technological developments and innovative applications in the field of aviation, space, aerodynamics, thrust forces, data processing, communication systems, advanced materials, unmanned aerial vehicle, space systems, and others.

The Egyptian Space Agency's mission is to create, transfer, localise, and develop space science and technology, as well as to have the capability to manufacture and launch satellites from Egyptian territory to support the government's development and national security strategies.

The first made-in-Egypt satellite will be launched in 2022 as a result of a cooperative effort amongst engineering faculties of Egyptian universities to design and test satellites, putting Egypt on the satellite manufacturing line. According to the President of the Egyptian Space Agency, a copy of the satellite will be manufactured and must pass specific tests with a 100% success rate before it can be launched. Egypt also manufactures a satellite comprising 45% Egyptian components and 55% foreign components. The first made-in-Egypt satellite will be manufactured and delivered to the launcher to be launched in 2022, bearing in mind that the small satellite costs \$20 million from manufacturing to launch. The state's space budget this year is \$550 million.



Egypt plans to launch 4 CubeSat satellites for remote sensing and scientific research next year, as part of a strategy to localise and develop the peaceful use of space science and technology. This strategy also aims to build space systems using purely Egyptian technology to help prepare future generations and scientific cadres to advance the country, support Egyptian industry, and bring it into global competition.

According to the Plan, the Egyptian Space Agency satellite, “Eg-SACube-3,” which is fully designed at the Agency, will be launched in May 2022.

This satellite is 3 times larger than the normal size of CubeSats satellites. The “EgSACube-4” satellite, with a mass of 1.3 kg, will be also launched in collaboration with Benha University. In addition to the “NEXSat” satellite, the first satellite for Egyptian universities will be launched in the second half of 2022, in collaboration with a German corporation.

A deal was also struck with Japan for the launch of the Egyptian universities satellite. The components, design, and testing of this satellite are all pure Egyptian. It measures ten centimetres by ten centimetres and weighs around one kilogram. It is a remote sensing satellite with a camera to capture photos of the Earth that will be launched from the International Space Station in orbit (450) km.

In collaboration with a German corporation, the “NEXSAT” satellite will be launched at the end of next year. It’s a small satellite that weighs 65 kg and is used for remote sensing. On the other side, “EgyptSat 2” satellite is intended for remote sensing and scientific research purposes, and will be launched in cooperation with the Chinese side in the first quarter of 2023. It is a medium-sized satellite that weighs (350) kg and is equipped with high-definition cameras with a range of (2) metres.

The satellite design and engineering model has been completed, and the space model is now being developed.

Egypt Missile Capabilities

The Egyptian Air Defence Forces (EADF) is the fourth force in the Egyptian Armed Forces and has the combat capabilities to tackle present and anticipated air attacks in order to safeguard important targets in Egypt, as well as the armed forces' theatre of operations in all strategic directions. The EADF is keen to possess the combat capabilities that enable it to perform its tasks efficiently through the development and modernisation of air defence systems, taking into account the diversity of weapons sources according to scientific bases that are followed in the Egyptian Armed Forces by benefiting from military cooperation with brotherly/friendly countries in various fields through the following three paths:

- Military cooperation through the implementation of joint exercises to gain experience and learn about the latest methods of planning and managing operations in these countries;
- Cooperation in training Air Defence Forces fighters including commanders and officers by sending a number of prominent Egyptian Air Defence officers to prestigious military institutes and colleges in brotherly and friendly countries to learn current military sciences; and
- Cooperation in the development and modernisation of weapons and equipment in order to improve the EADF's combat capabilities and carry out the development and modernisation work required by the Egyptian air defence system in accordance with Egyptian combat doctrine, as well as overhauls and the prolongation of the life of current equipment in a specific and continuous plan.

Air Defence Systems:

The Egyptian Air Defence Forces possesses (4) of the most powerful Russian air defence systems. These systems constitute a significant threat to any air threats, regardless of their nature or severity. Egypt also possesses, in the first place, the long-range S-300VM (Antey-2500) system, which has a superior ability to strike short and medium-range ballistic missiles (launched from a range of up to 2500 km), cruise missiles and

highly manoeuvrable aircraft with a range of (250 – 350) km, and a maximum altitude of up to (30) km with enormous immunity against various dense electronic jamming systems.

Furthermore, Egypt possesses the Buk-M2E medium-range system with a superior ability to strike tactical ballistic missiles launched from a range of (200-300) km, such as missiles launched from rocket launchers, cruise missiles, anti-radar missiles, and fighter aircraft at a range of up to (45 km and altitude up to (25) km, with immunity against electronic jamming systems. The EADF possesses the medium-range Pechora-2M system, which has electronic obstruction resistance and the capacity to adjust the track of anti-radar missiles, as well as a thermal/electro-optical sensor system as a radar alternative. This system can engage cruise missiles, fighter aircraft and helicopters at a range of up to (32 km), and an altitude of up to (20) km.

Buk M 1-2 / Sam 11	Russia	Unknown	Medium-range air defence
Buk-M2 / Sam 17	Russia	Unknown	Medium-range air defence
Crotale	France	Unknown	Medium-range air defence
Pechora-2M	Soviet Union	Unknown	Medium-range air defence

The Tor-M2E system, for example, is distinguished by its greater ability to hit cruise missiles, bombs, smart munitions, air-launched projectiles, fighter aircraft, helicopters, and drones at a range of up to (15) km and an altitude of up to (10) km.

Tor-M1	Russia	16	Short-range self-propelled anti-aircraft missile system
Tor-M2	Russia	Unknown	Short-range self-propelled anti-aircraft missile system

These systems, together with the rest of the western and eastern air defence systems, early warning and radar and optical air defence reconnaissance stations, including radars and stealth aircraft detection systems, are integrated and linked to the command and control network. This implements the multi-layered air defence principle, which provides integrated protection for forces and important targets from a variety of threats.

Egypt considered the deployment of a significant number of different types of radars to give radar coverage of Egyptian airspace at various altitudes when creating and modernising its air defence system. It also considered the deployment of a number of Buk / Tor-M missile battalions, as well as a large number of Igla-S shoulder-fired missile platoons, to strengthen the capacity to engage air targets at various altitudes.

Modern electro-optical systems have also been provided to increase the air defence's ability to detect targets and quickly deal with them. Technical security systems for missiles, radars and technical equipment, border control systems, maritime domain awareness systems and equipment, including fixed and mobile radars and their auxiliary means, fixed, mobile and airborne electro-optical and infrared sensor systems, wireless means of communication, a hybrid power generation system, television surveillance cameras, data and power distribution units, an automatic identification system, various other monitoring and survey means and some means of technical and logistical support for the transaction have been also developed.

Table (a): Technical and Tactical Features Of The Available Medium-Range Anti-Aircraft Missiles

Features	Volga (SAM-2)	Pechora (SAM-3)	Quadrat (SAM-6)	Hawk
Producing Country	Russia	Russia	Russia	USA
Max Height (km)	35	18	18	17
Min Height (m)	100	20	60	20
Max Tilt Distance (km)	54	25	25	37
Far limit of destruction area (km)	43 positive 54 negative	25	21	37
Max engagement speed (m/s)	1100 close 420 far	310 close 420 far	600 close	1125 close

(Continued)

Table (a): Technical and Tactical Features Of The Available Medium-Range Anti-Aircraft Missiles

Features	Volga (SAM-2)	Pechora (SAM-3)	Quadrat (SAM-6)	Hawk
No. of targets that can be automatically engaged in a battalion	1	1	1	2
Launcher propulsion time (min)	8.5	8.5	8.5	7
Engagement time in the battalion	2.5-4 hours	2-2.5 hours	15 minutes without cables and 30 minutes with cables	45 minutes
Preparation time for movement	2.5-4 hours	2-2.5 hours	6-15 minutes	30 minutes
Probability of hitting the target	82-91%	82%	80%	80%
a. 1 Missile				
b. 2 Missiles	96%	97%	96%	96%
c. 3 Missiles	99%	-	99%	99%
Interval between missiles	6	5	6 of one launcher 3 of two launchers	6

Table (b): Technical And Tactical Features Of The Available Short-Range Anti-Aircraft Missiles

Features	Chaparral	Crotale	Amoun
Producing Country	USA	France	Italy - USA
Detection Range	30/60 km	20 km	20 km
Minimum Detection Distance	40 m	24 km	--
Tracking Distance	16 km	16 km	20 km

(Continued)

Table (b): Technical And Tactical Features Of The Available Short-Range Anti-Aircraft Missiles

Features	Chaparral	Crotale	Amoun
Speed of the targets that can be engaged in the battalion	Minimum speed 20m/s	440 m/s	400 m/s close 200 m/s far - lowest speed
No. of targets that can be automatically engaged in the battalion	4	2	3
Engagement Systems	Radar - Thermal - Optical	Radar - TV	Radar - TV - Optical
Reaction Time	11 sec	10.33 sec normal 6.33 sec urgent	8-10 sec for missiles 5.5 sec for 35 mm2 artillery
Destruction zone boundaries	6 km	10 km	8-12 km
a. Far Boundary			
b. Close Boundary	500 m	500 m	1 km
c. Upper Boundary	3 km	4.5 km	3.5-4 km
d. Lower Boundary	15 feet	50 m	20-40 feet
Hitting Preparation Time	15 feet	15 feet	12 feet
Movement Preparation Time	15 feet	15 feet	6 feet

Tactical Surface-To-Surface Missiles:

Surface-to-surface missiles are considered the long arm of Egypt. Egypt is regarded as one of the first countries in the area that produced and developed ballistic missiles, having embarked on the missile trip in the 1960s as part of a military project, although it was unsuccessful owing to the political conditions at the time. Egypt considers ballistic missiles of various ranges and types to be the main power of its military forces, and several tests have been conducted in the quest of cooperative manufacture with many countries.

To overcome technological challenges, Egypt is developing an Egyptian missile system by relying on countries that produce missiles, particularly former Eastern Bloc countries, to provide it with these systems, allowing Egypt to develop a deterrent force that is proportional to the surrounding international and regional situations.

- (9) Frog-7 Launchers.
- (24) Sakr-80 Launchers.
- Unknown number of launchers, for tests.
- (9) Scud-B Launchers.

Anti-Tank Guided Missiles (ATGM):

a. (271) Self-Propelled Launchers:

- 52 M-901 launchers.
- 219 YPR 765 PRAT launchers.

b. (2100) Shoulder-Fired Rocket Launchers:

- 1, 200 AT-3 Sagger launchers, including “BRDM-2.”
- 200 Milan launchers.
- 700 TOW-2 launchers.

c. Anti-Armor Missiles (RPG-70, Swingfire, BGM-71 TOW, HG8)

RPG-7	Egypt	179,000+ units	locally made
Swingfire	United Kingdom Egypt	260+ units	wire-guided anti-armour missile system (locally made)
9M113 Konkurs	Soviet Union	Unknown	wire-guided anti-tank missile, mounted on Fahd armoured personnel carriers purchased in the 1990s
HJ-8	China Egypt	Unknown	Locally Produced Version Named AHRAM

Naval Capabilities Upgrading:

In terms of supporting the main branches, the political and military leaderships were eager to support the Egyptian Navy Forces and improve its capabilities in order to defend Egypt's maritime domain, which has unparalleled strategic sea views stretching over two thousand kilometres along the Mediterranean and Red Sea coasts. The political and military leaderships were eager to provide the Egyptian Navy Forces with the latest naval weapons employed by developed countries' forces.

Egypt has border control systems, maritime domain awareness systems and equipment, including fixed and mobile radars and their auxiliary means, fixed, mobile and airborne electro-optical and infrared sensor systems, wireless means of communication, a hybrid power generation system, television surveillance cameras, data and power distribution units, an automatic identification system, various other monitoring and survey means and some means of technical and logistical support for the trans-action.

The missile systems and armaments of the naval forces were designed in accordance with accurate estimates of the naval forces' future tasks in light of the Middle East's maritime security challenges and the multiplicity of conflicts resulting from international and regional changes in the region, as well as their impact on Egyptian and Arab national security. As a consequence, the Egyptian Naval Forces obtained the most up-to-date

positive armament systems, including advanced combat and technological missiles, allowing it to keep its naval units in deep waters and safeguard Egypt's capabilities in the exclusive economic zones.

Naval Armament Of Main Surface-To-Surface Fighters:

a- Frigates: Total (8) Frigates:

- Harpoon tactical RGM-84C surface-to-surface missiles, anti-submarine missiles, and twin torpedo tube (324 mm), with a total of four torpedoes.
- Harpoon tactical RGM-84C surface-to-surface missiles, and (36) SM-1MP surface-to-air missiles.
- 4 dual surface-to-surface missiles, each equipped with HY2 (CSS-N-2) Silkworm tactical surface-to-surface missiles, and 2 depth charges launchers, with a total of ten missiles.
- RGM-84C HarpoonAShM missile, an Aspide surface-to-air missile launcher, and two 324 mm anti-submarine torpedo tubes with a total of (6) each fitted with a Sting Ray light torpedo.

b. Coastal Patrol Boats:

Missile Boats:

- Otomant single rocket launcher.
- 324 mm torpedoes, four rocket launchers, and “three additional reserve boats.”
- Two SY-1 surface-to-surface tactical missiles.
- SS-N-2A Styx surface-to-surface tactical missiles.
- SAN-5 Grail Strela surface-to-air missile (manual aiming) and BM-24 multiple rocket launcher with (12) tubes (card 12).
- 533 mm single torpedo tubes and BM-21 multiple rocket launcher with (18) tubes (card 8).

Projectiles:

- SSC-2B Samlet tactical surface-to-surface Projectiles.
- Otomat surface-to-surface missiles.

Air-Launched Missiles:

a. 245 Air-To-Surface Missiles:

- AGM-65A Maverick.
- AGM-65D Maverick.
- AMG-65F Maverick.
- AGM-65G Maverick, AGM-119 Hellfire, AGM-84 Harpoon and AM-39.

b. Anti-Radiation Missiles:

An unknown number of Armat missiles.

c. Anti-Submarine Missiles:

An unknown number of AS-12 Kegler and AS-30L Hot missiles.

d. Air-To-Air Missiles:

An unknown number of the following missiles:

AA-2 Atoll, AIM-7E Sparrow, AIM-7F Sparrow, AIM-7M Sparrow, AIM-9F Sidewinder, AIM-9L Sidewinder, AIM-9P Sidewinder, R550 Magic and R530.

Air Forces Upgrading:

Because of its critical role in Egypt's defence system, the Egyptian Air Defence Forces has received a lot of attention from the political and military leaderships. The development and upgrading were based on providing the Air Forces with new, modern, and advanced aircraft from a variety of sources, in line with Egypt's strategy of diversifying arms sources. The development system within the Air Forces encompasses various disciplines, including weaponry, as the Armed Forces General Command is determined to consistently update the capabilities of the Air Forces by providing an advanced system of multi-tasking aircraft. It includes Rafale aircraft, due to its armament systems and technical and fighting

capabilities, armed drones, CASA transport aircraft, early warning and reconnaissance aircraft, attack and armed helicopters, and public service helicopters from various countries around the world in proportion to the Air Force's operational requirements, ensuring that the Air Force has a fully integrated system of the most modern aircraft.

The development of the Air Forces is one of the procedures that require long-term planning because it is influenced by a variety of factors and considerations, including regional and international changes and their impact on Egyptian and Arab national security, the nature and size of hostilities and threats facing the state and developments thereon, and the nature and size of future Air Forces' tasks. The state's economic position and political situations, whether at a regional or worldwide level, have a direct impact on the Air Forces' development.

Development must meet two key requirements in order to contribute to the achievement of its objectives:

- Achieve qualitative and quantitative supremacy, or at the very least the capacity to inflict intolerable losses on the enemy, and
- Optimise the Air Forces' effectiveness in carrying out all assigned tasks.

The issue of armament is of paramount importance to Egypt since it is the backbone of the aircraft. Egypt diversifies these missiles in terms of ranges and types to deal with all threats and impediments in varied atmospheres. Furthermore, Egypt requires in its contracts that the armaments be the most advanced and technically sophisticated in the world, as was done in the recent French aircraft deals.

References

Military Balance, the International Institute for Strategic Studies, Oxford -
.Central University Press

www.cia.gov/library/publications/the-world-factbook/index.html -

The Missile Capabilities of Nonstate Actors in the Middle East

9

MUHAMMED MANSOUR*

In recent years, conventional missiles have become a major part of the armament system enjoyed by many armed groups and organizations, especially in the Middle East, after they had been almost entirely confined to regular armies until the early 1980s. These capabilities have also developed over recent decades, both quantitatively and qualitatively, and have come to pose a real threat to the security and military systems of the countries of the region. This development saw the transformation of the missile from an imprecise support weapon that was rarely in the possession of these groups, to a deterrent weapon that poses a threat to regular armies and military and security systems around the world.

The missile capabilities of these groups have increased over the years. They now have the expertise to locally manufacture many of these missiles, as well as growing experience in their use due to the ongoing conflicts in the region. The development of missile capabilities has also involved the introduction of techniques for loading missiles onto drones

*RESEARCHER AT THE EGYPTIAN CENTER FOR STRATEGIC STUDIES

and some naval equipment, as well as the availability of both the ballistic and cruise variants, allowing assaults on targets at long distances.

In this context, the case of four main armed groups can be studied: the Popular Mobilization Forces in Iraq, Hezbollah in Lebanon, the Palestinian factions in Gaza, and the Ansar Allah group (the Houthis) in Yemen. Despite the different environments in which these groups operate, a major common denominator they share is that Iran is their main source of arms and is transferring to them technical and field expertise and is using them to fight proxy wars to serve Iranian interests.

Popular Mobilization Front in Iraq

In June 2014, prominent Iraqi Shiite leader Ali Al-Sistani issued the so-called Collective Jihad “al-Jihad al-Kifai” fatwa to resist the expansion of ISIS in Iraq. Iran took advantage of this situation to dominate the Popular Mobilization Front (PMF) through the influence of the Quds Force in Iraq on PMF leaders.

Despite the restructuring of the PMF – under the new title Popular Mobilization Authority – as a security institution affiliated with the supreme commander of the armed forces, some factions did not accept the merger and were more loyal to Iran. The PMF have gone through different stages of being armed with missile arsenals, and these stages can be divided into two main parts:

- ***Pre-restructuring (2014-2016)***

This stage was during the formation of the PMF, when ISIS was invading Iraq across the Syrian border and taking over nearly a third of the country. The PMF’s operations were limited at that time to the confrontation with ISIS until the liberation of Mosul in October 2016. Later, Tehran was keen to maintain the relationship with many of these factions and in order to use their experience in the field to impose Iran’s agendas inside Iraq.

During that stage, the missile armament of the PMF was limited to the Soviet-made 122 mm BM-21 GRAD rocket artillery and the 107 mm rocket launchers, and their Soviet, Chinese and Iranian-made copies. The main source of this arsenal was the stores of the former Iraqi army. This is

in addition to the support provided by the Iranian Revolutionary Guard to these factions⁽¹⁾.

The missile armament of some of the PMF factions developed during the battles of Mosul. That these factions, with the help of Tehran, entered a new phase where they locally manufactured short-range missiles that are propelled in the same way as inertial artillery shells. It is likely that the old Soviet air defense SAM-2 missiles were modified to carry a heavy conventional warhead (weighing between 250 and 500 kg), with a range of between 2 and 4km. In addition to this model, other models of short-range missiles include Al-Tuffof, Qasim, Ashura, Al-Qaher, Zulfiqar, Al-Ashtar, Khaybar, and Al-Battar, all of which were based on engines from 107mm and 122mm artillery rockets, in addition to the Iranian-made Falaq missiles with their large warheads, which made the actual calibers of these missiles range between 240 and 400mm.

Regarding launching platforms, the PMF during this period relied on single, dual and triple platforms loaded on trucks. In addition, it modified some military vehicles of the former Iraqi army and converted them into self-propelled launch platforms, such as the launch pads of the Soviet self-propelled air defense systems SAM-6⁽²⁾, which were modified to launch large-caliber missiles (333 - 366mm).

These models were used mainly during the battles with ISIS in Mosul, and their production was expanded further in subsequent years. Their destructive power during the battles was great given the amount of explosives in most of the warheads. However, these missiles have a large margin of error because they are unguided, and depend on inertia and the angle of launch to reach their target.

▪ *Phase Two 2016-2021*

After ISIS' area of control in Iraq started shrinking in late 2016, the Iranian strategy in the country began to focus mainly on using the PMF to serve Iran's anti-US agenda, putting continuous pressure on US forces in Iraqi and confronting the US at the regional level.

In this context, the tactics of the PMF with regards to missile force were based on three main axes:

The first was obtaining better missile capabilities in terms of range and accuracy. US reports⁽³⁾ indicated in August 2018 that Iran had

transferred a few dozen short-range ballistic missiles to the PMF, including Zelzal missiles (150–250km), Fateh 110 (200–300km), and Zulfikar (700km).

This is in addition to the fact that the PMF received, during the years after the liberation of Mosul, Iranian-made Fajr-1 and Fajr-5 missiles, which are similar in their mechanism to Russian artillery rockets.

These factions also obtained Iranian-made copies⁽⁴⁾ of the 122mm Soviet GRAD rocket launchers, specifically the 122mm Raad-24 and Raad-36 rocket launchers. The first type was installed on trucks manufactured in Iran with a license from European companies, such as the German companies Iveco and Rheinmetall.

The second axis was the inclusion of locally made missile launching mechanisms in the arsenal of the PMF, which clearly started in 2017 by modifying a number of US-made heavy military trucks to carry multi-nozzle platforms and launch locally made 240 and 300mm caliber missiles. Names like Raad and Nimr were given to these platforms. These modifications improved the ability to transport and launch these missiles, especially since some of the trucks were equipped with a reloading mechanism for the launcher.

The third axis is how the missile strategy of the PMF has become closely linked to the relationship between Tehran and Washington politically and in the field. This missile force has since 2018 become an effective tool in Tehran's hands to target the US diplomatic and military presence in Iraq and a way to respond to Israeli attacks on Iranian sites in Syria.

It is conceivable that there are two paths in this context:

The first track began in September 2018, when some of the PMF launched a series of attacks on US military sites in Iraq, which included the use of improvised explosive devices, firearms, mortars, and rocket-propelled 107 and 122-caliber grenades. It is worth noting that these attacks were carried out by armed groups that are unknown on the field level⁽⁵⁾, but these groups served as a front for some of the PMF and part of an Iranian strategy to soften the image of these factions, which are now within the Iraqi government security and military body, to shield them from any US reactions. Examples of these groups are Qasim al-Jabarin, which is affiliated with the Iraqi Hezbollah Brigades, the Ashab al-Kahf

group, and the Awliya al-Dam Brigades, which are affiliated with the Asa'ib Ahl al-Haq faction. These groups have carried out several missile attacks, including on US diplomatic headquarters (the consulate in Basra and the embassy in the capital), economic facilities (the oil fields where US companies operate in Basra), military facilities such as the air bases Ain al-Assad base and Balad base, and military training facilities in Taji, Mosul and Nineveh.

During this stage, the groups used homemade launchers that were installed on light civilian trucks, or on the ground at 2-3 km from the target. These launchers were, in their entirety, designed to launch Chinese and Iranian-made 107 mm missiles, in addition to a few of these attacks used rockets larger than 122mm, but given that these rockets are unguided, they were launched more for propaganda than tactical, and the purpose was to send messages to the United States and the Iraqi government.

The second track: After the killing of Major General Qassem Soleimani, commander of the Quds Force in the Iranian Revolutionary Guard, in a US raid near Baghdad International Airport, a new path began in the missile strategy of the PMF. US reports that followed Soleimani's killing indicated that some factions affiliated with the Popular Mobilization began using qualitative missiles in their attacks against US military sites in Iraq, and "quality" here means copies of 122-caliber artillery rockets, which has a range of up to 40km and fires between 15 and 20 missiles in one strike. This resulted in the first US casualties as a result of the Popular Mobilization's missile operations, when in March 2021 the Iraqi Hezbollah faction bombed the Ain al-Assad air base, killing an American civilian contractor. This stage also witnessed Tehran's introduction of attack drones into the arsenal of the PMF⁽⁶⁾, which serve as either roaming munitions or as vehicles for unguided munitions. For this purpose, Tehran has established other unknown armed groups, like the groups that were established to take responsibility for the missile attacks on US military bases in Iraq. Examples of these groups include the Khaybar Brigade, which has claimed several drone attacks on US sites since March 2021, the most high-profile of which were an attack on Erbil Airport in Iraqi Kurdistan in April 2021, another in the same month on Balad Air Base, and a third in June on Ain Al-Assad Air Base.

These types of drones were publicly revealed during a PMF military parade last June, during which three types of Iranian unmanned aircraft appeared⁽⁷⁾. The first type was an attack drone whose design is identi-

cal to the Iranian-made Mohajer-6 aircraft, which carries two anti-tank missiles. The second type was an unmanned reconnaissance aircraft, the design of which appears very close to the Iranian-made Ababil-3 aircraft. The third type was the Safir small reconnaissance aircraft, which can be considered an indication that the PMF, at the missile force level, have taken the mixed tactic that is also followed by Ansar Allah group (Houthis) in Yemen, where missile capabilities are combined with pilotless aircraft to carry out attacks.

Ansar Allah (Houthis)

The missile capabilities of the Houthis in Yemen began to be clearly formed after their control of the Yemeni capital Sanaa in September 2014, when the group seized control of the missile stores that had been available to the Yemeni army. These included short-range 107 and 122 mm-caliber artillery launchers and a number of self-propelled Soviet Scud-B ballistic missiles, with a range of about 500km, and the Tochka tactical ballistic missiles with a range of 70-120km. In the first phase of the conflict, Iran provided the Houthis with the technical capabilities necessary to launch a local missile manufacturing program. This program relied on the production of missiles identical in design to the Soviet and Chinese short-range missiles, especially the Soviet GRAD missiles. In 2015 and 2016, the group produced a short-range Sarkha missile with a range of 17km and a 15kg warhead and artillery rockets (Al-Najm al-Thaqib 1 and 2), which have a range of 45-75km and are characterized by the possibility of launching them in twos or threes through self-propelled platforms.

The group also developed during the same period a series of short-range ballistic Zelzal missiles⁽⁸⁾, of which three generations were produced. These can hit targets at a distance of 3-65km and were distinguished from their predecessors by a fragmentation warhead (140-500kg). The group also produced a similar missile system called Al-Samoud, with a maximum range of 38km and a warhead with a weight of 300kg⁽⁹⁾.

With the help of Tehran, the group also produced Qaher-1 missiles, which are modified from the Soviet air defense missiles (SAM-2), according to which they were transformed into surface-to-surface missiles with a range of 250km, and are capable of carrying an explosive charge of up to 200kg. In March 2017, the group announced a new generation

of these missiles under the name Qaher-2M, in which the range was increased to 400km and the explosive charge was increased to 350kg. The importance of this type of missile lies in that its use in the field represented a shift in the missile strategy of the Houthi group, as these missiles were used for the first time in February 2015 to target the airports near Saudi Arabia's southern border, especially the airports of Najran and Abha. This was an evolution of the strategy that was followed during 2014, which focused exclusively on Yemeni territory.

The development of ballistic missiles by the Houthi group entered a new stage in late 2016 at the operational and armament levels, in which the group expanded its missile operations to increasingly include sites outside Yemen. In September 2016, the group announced the start of manufacturing the Burkan-1 ballistic missile, which in terms of design and characteristics is a copy of the Iranian Qaem missile, which in turn is based on the North Korean ballistic missile HWASONG-6 and the Soviet Scud-C. This missile was used for the first time in October of the same year to bomb King Abdulaziz Airport in the Saudi city of Jeddah, as well as other sites, including the city of Taif. The range of this missile is between 800 and 900km, and its total weight is eight tons, including about half-a-ton of explosive materials⁽¹⁰⁾.

The second generation of this type appeared publicly in February 2017 under the name Burkan 2H in an attack on a Saudi military site west of the Saudi capital, and then it was repeatedly used to target sites inside the capital, including King Khalid Airport. The range of this generation is 1,400km. As for the third generation of this series, it was named Burkan-3 and was used for the first time in the field in August 2019 to target the Saudi city of Dammam. It is the longest-range ballistic missile in the group's arsenal, and it was recently renamed to Zulfiqar.

With the intensification of battles within Yemeni territory and Tehran's increasing desire to increase missile strikes inside Saudi Arabia, Iran began to provide the group with cruise missiles⁽¹¹⁾ identical in design to the Iranian Sumar missiles. These are a locally made version of the Soviet KH-55 cruise missile with basic modifications to the location of the engine and steering wings. The Iranian version is equipped with an inertial navigation system enhanced by previously entered information with the help of satellite navigation.



(Quds-1 cruise missile)

The Houthi version of these missiles was called Quds-1, and it appeared for the first time operationally in late 2017 when the group announced that it had used one to target the Barakah nuclear reactor in the United Arab Emirates. They were also used in 2019 to target Saudi Arabia's southern border airports as well as the electricity and water desalination plants in Al-Shuqaiq in the southwest. The range of this missile is between 140 and 180km. The group announced in November 2020 a second version of this missile under the name Quds-2, which has a range between 1,500 and 2,000km and was used to target a distribution station for petroleum products north of Jeddah in western Saudi Arabia.

The manufacturing of artillery shells did not stop during this stage. Since 2018, several generations of missiles derived from the Iranian-made rocket artillery Fajr-5B have appeared in the Houthi group's missile arsenal. The first type was the Badr-1 missiles, which were used for the first time in March 2018 to target Aramco oil company facilities in Najran. Then it was announced in October of the same year that the guided version of these missiles was called Badr-1B, and had a range of 150km. In April 2019, the new generation of these missiles was announced under the name Badr-F, which is also guided but features a fragmentation warhead. The last missiles in this series were announced in March 2021 under the names Nakal, Sa'ir, and Qasim⁽¹²⁾.

What is remarkable about the missile armament experience of the Houthi group in Yemen is that unlike the experience of all other groups loyal to Tehran in the Middle East, it included the air and naval arenas as well, which was brought about by the comprehensiveness nature of the battles in Yemen.

With regard to naval missile armament, the group seized control of the Chinese naval missiles C-801, which were among the armaments of the Chinese-made Hunan-class missile boats of the Yemeni navy. So, the group assembled the remaining missiles in line with this type and began to use them under the name Al-Mandab-1 to target the naval vessels of the Saudi coalition through a series of operations that began in October 2015. In November 2019, the US intercepted a boat near the Yemeni coast that was carrying a shipment of weapons including the Iranian naval missile Noor, which is a copy of the Chinese naval missile C-802.

▪ *Air defense*

The Houthis benefited from the Iranian experience in dealing with Soviet-made air defense systems. In 2017, the group modified the Soviet SAM-6 medium-range air defense missiles, which were previously owned by the Yemeni army, to be launched from fixed and wheeled platforms. This system was named Fatir 1⁽¹³⁾. Its maximum range is 24km and it can target enemy aircraft at altitudes of up to 14km. The warhead weight of the missile is 60kg.

The group also worked to modify the missiles of fighter aircraft and convert them to surface-to-air missiles instead of air-to-air missiles. These attempts are inspired by previous experiments carried out by the Serbian army during the 1990s, by making modifications to short- and medium-range rockets for air combat to be launchable from self-propelled ground platforms. This was done by providing them with the necessary energy to launch from a separate electrical source, and then using the thermal inductors of these missiles to track the heat from hostile aircraft.

This trend resulted in the development of the Thaqib 1 system, a local development of the Russian air-to-air missiles R73, of which the Yemeni Air Force possessed 150 that were received between 2002 and 2005 to arm the MiG-29 fighters. The range of this modified missile is 9km and it is equipped with a 7kg warhead. This missile entered service in September 2017.

The group then added two more missile systems under the names Thaqib2 and Thaqib3⁽¹⁴⁾. The first was announced in January 2018, a local variant of the Russian air engagement missile RT27, of which the Yemeni Air Force acquired 100 in 2002. The Houthis modified the missile to be launched from ground platforms and improved its heat seeking

ability. After modification, the missile has a range of 15km at altitudes of up to 8km, and it is equipped with a relatively large 40kg warhead. As for the second system, it appeared for the first time in 2016 and is a variant of the Russian medium-range air combat missile R77, of which the Yemeni Air Force acquired 100 between 2004 and 2005. This missile is characterized by self-guided radar with the ability to modify targeting by means of external radar guidance. The weight of its warhead is 22kg and its modified range is about 20km.

It can be asserted that in 2014, the Houthi group's use of missile systems was confined to its battles with the government forces of Yemeni President Abd Rabbo Mansour Hadi. However, their missile use took a regional character in 2015, and it is now used to exert pressure on neighboring actors in the Gulf, and this pressure is adjusted depending on the given state of Iran's relationship with Saudi Arabia and the UAE.

The Palestinian Factions in Gaza

The armed Palestinian factions in Gaza have a long experience in missile armament. During the 1980s and 90s, their missiles consisted almost entirely of Soviet and Chinese short-range rocket launchers, but the year 2001 can be considered a starting point for the local Palestinian effort to produce missiles capable of targeting Israeli settlements and cities close to the Gaza Strip. The Izz al-Din al-Qassam Brigades, which are affiliated with the Hamas movement, began producing the first generations of Qassam rockets, based mainly on the Soviet Katyusha launchers, and the first operational use of this missile was in the same year⁽¹⁵⁾.

The first generation of these missiles did not exceed a range of 3km, and its warhead had little destructive power, as it weighed only 1kg. Over the following years, the Qassam Brigades developed other generations of this missile. The second generation was in 2002, and it had a maximum range of 12km with a warhead weighing 6kg, and then the third generation in 2005, which reached a maximum range of 16km with a 10kg warhead⁽¹⁶⁾.

After that, the missile arsenal available to the Palestinian factions improved. Beginning in 2007, it was armed with the Russian GRAD missile artillery, whose range is between 20 and 40km, and was also equipped with a Chinese-made version of these missiles with a range of 45km and 20kg warheads.

The first pivotal development in the armament of the Qassam Brigades was in 2012⁽¹⁷⁾, when it announced the production of the M-75 missile, which was developed from the Qassam series of missiles, and was used for the first time in 2012 in the bombing of Tel Aviv. The range of this missile was 75km, and it was distinguished by the size of its large warhead compared to all other generations of homemade missiles, as its weight ranged from 50 to 70kg.



(R-160 missile)

In 2014, the second phase of local Palestinian missile production began⁽¹⁸⁾. That year, specifically in the clash between the Palestinian factions and the Israeli army in July, witnessed the use of several types of new homemade missiles, which constituted a qualitative leap in range and destructive capacity. The most important of these missiles is the R-160 missile, which was used for the first time and has a maximum range of 160 km. It is a class of artillery rockets with a 100kg warhead. It was used in the bombing of the cities of Hadera and Haifa.

In addition to this type, the Sejjil 55 missile, which has a range of 55km and a 10kg warhead, was used in the bombing of several areas south of Tel Aviv. Also used was the J-80 missile with its range of 80km a 125kg warhead. The latter managed to reach Tel Aviv, and the Israeli air defense systems failed to intercept it.

Another Palestinian faction, Al-Quds Brigades (the military wing of the Islamic Jihad movement), began on a small scale in 2006 to develop its own homemade missiles, such as the Quds 101, which has a range of

16 km and was used for the first time in 2006 to bombard the city of Majdal. This is in addition to the Buraq series of missiles, of which two versions were produced, the first with a maximum range of 70km, and the second with a range of 100 km. One of these versions, with a 90kg warhead, successfully hit Tel Aviv in July 2014.

In late 2018, some features of the Iranian experience in missile manufacturing began to appear in the arming of some Palestinian factions, when the Al-Quds Brigades announced the Badr 1 missile, which it used for the first time in late 2018 to target the city of Ashkelon and several nearby settlements. This missile has achieved many successes, especially since its design was derived from similar experiences in Syria and Yemen. It is a 107mm artillery rocket launcher whose warhead has been modified and its range has been increased from about 5km to 11km⁽¹⁹⁾.

In May 2019, the Al-Quds Brigades announced the Badr 3 missile, which is a clone of one of the copies of the Soviet GRAD artillery rocket launchers, specifically the cluster version. This is identical in design and mechanism to a missile announced by the Houthi group in Yemen in April of the same year under the name Badr-F. Al-Quds Brigades were able to target the city of Ashkelon and other areas in the northeast of the Gaza Strip with this missile, which has a range of 45km and is distinguished by how it explodes 20 meters above the target, producing shrapnel and causing significant damage⁽²⁰⁾.

The clash with Israel in May 2021 marked a qualitative change in the missile tactics employed by the Palestinian factions in Gaza. During this clash, the Qassam Brigades mainly used two new types of missiles. The first was the Ayash-250, which was used in the bombing of a site north of the city of Eilat in the Hevel Eilat area, about 217km from Gaza. This is the maximum range the Palestinian factions' rockets have been able to reach so far. The second new type of missile was the A-120, which has a range of 120km, and was used to bombard areas south of Tel Aviv and the vicinity of Ashdod.

The rockets launched from Gaza, even though Israeli defense systems managed to intercept much of them, managed to achieve direct hits in most major Israeli cities, including Tel Aviv, Ashdod, and Ashkelon, where a fuel tank was directly hit. In addition, the Palestinian factions were able to sustain high-intensity rocket fire despite the intense aerial efforts of the Israeli Air Force, as well as increase the operational arc

of their rockets from 160 km to about 250 km. They were also able to target the entire coastal strip, from northern Gaza to the areas adjacent to the city of Haifa.

The most important point about the emerging threat posed by Palestinian rockets is in the “missile dumping” that makes it difficult for Israeli anti-missile systems to deal with, forcing them to only intercept missiles that are most likely to hit a target. Most of the Palestinian missiles do not have the guidance mechanisms in surface-to-surface missile systems, such as passive or positive radar guidance, laser guidance, or even guidance via the Global Positioning System. They are rather aimed towards their target at an arch in the same manner as artillery shells, which leaves a large margin of error. However, the probability of hitting the targets remains high to the simultaneous launching of a large numbers of missiles (sometimes up to 100 in just three minutes) at as low an angle as possible. The latest conflict also saw the use of a variety of launch platforms, whether self-propelled, underground, or surface. These platforms, which previously had one, two or four nozzles, have been equipped with multiple nozzles, which allows for launching a large number of missiles simultaneously.

It must be noted that the missile activity of the Palestinian factions in this clash was clearly flexible, as the artillery positions of the Israeli army were targeted on the Gaza border with heavy mortar shells. On several occasions, missiles were launched at Tel Aviv immediately after Israeli forces carried out a raid on a residential neighborhood in Gaza, a method by which the factions want to impose a deterrent equation that, if successful, would make the Israeli leadership consider the consequences of its raids on the Strip. This is especially the case since the Palestinian missile strikes targeted a number of Israeli military airports like the Hatzarim base, as well as the radar sites of the Iron Dome interceptor systems, and even gas exploration platforms in the Mediterranean.

Interactions with the Israeli army were the main driver of Palestinian missile activity, unlike the reality of the situation with the Houthis in Yemen, Hezbollah in Lebanon, or the PMF in Iraq. This unique context precludes the Palestinian factions from participating in any functional external roles similar to those exercised by regional factions loyal to Tehran, and makes them focus exclusively on escalation or calm with Israel.

Hezbollah in Lebanon

The 2006 Israel–Hezbollah War unveiled the contours of Hezbollah missile capabilities. Before of the War, Hezbollah’s missile arsenal consisted of the Russian 107-mm and 122-mm caliber Katyusha, the Iranian Falaq-1 and Falaq-2, the 5–35 km range Shaheen-I, the 45–75 km range Fajr-3 and Fajr-5, in addition to the unguided Zelzal-1, Zelzal-2, and Khaibar-1 rockets that have a range of 100–180 km and which were all used in the war and proved decisive⁽²¹⁾.

Lacking missile target accuracy estimation, Hezbollah deployed subtle tactics to overcome this obstacle, including compiling the available information about vital and strategic Israeli targets, particularly in the northern district bordering Lebanon. In obtaining these data, Hezbollah relied on open sources including press and television reports, online interactive maps, in addition to creating sector-specific detailed maps with the help of collaborators from inside Israel. These maps are then compared against GPS data for efficient calculation of firing angle.

Relatedly, Israel announced that Hezbollah managed to install equipment on the Israeli border to tap Israeli radio communications⁽²²⁾ which enabled it to obtain updated information about targets to be hit in the northern areas of occupied Palestine. This advantage was of service to Hezbollah as it allowed for the accurate resetting of firing angle based on the updated information and photos and videos broadcast on news channels. As such, Hezbollah managed – despite lacking guided accuracy capabilities – to introduce a missile deterrence equation called “Haifa and Beyond”, which provides that “the more the Israeli air strikes are, the deeper Hezbollah’s strikes will be.” On the fourth day of the war, Hezbollah’s missiles reached Tiberias, i.e. 40 km from the border. Haifa was hit for the first time on the fifth day of the war, along with other cities including Afula, Nazareth, Acre, and Nahariya. On the eighth day, missiles reached an altitude of 50 kilometers striking Ramat David. On the twenty-second day, Bisān, 68 km away near the border with Jordan, was attacked with a Khaibar-1 missile, marking the first-use of this kind of missile in the war. Ten days before the war was over, i.e. on the twenty-fourth day, Hezbollah used Khaibar missiles to strike Hadera, less than 5km from Tel Aviv ⁽²³⁾.

The 2006 war was the last military confrontation between Hezbollah and Israel and since then Hezbollah's missile capabilities have been a subject of speculation and hearsay.

Available data indicates that in the post-war years, Hezbollah managed to obtain Iranian missiles with a greater range, notably the Fateh-110 that has a maximum range of 250 km. Fateh-110 has a high degree of precision as it relies on inertial guidance as well as a GPS system where the specified coordinates can be updated during any flight phase. Additionally, estimates indicate that Hezbollah managed to obtain – via Iran and Syria – unspecified numbers of Scud ballistic missiles and modified their guidance ⁽²⁴⁾.

Upgrades introduced to Hezbollah's missile system were not limited to adding new types of missiles to the arsenal, but old missiles were modified and developed as well. Since 2018, Israeli military circles have been speaking of Hezbollah's upgrading Zelzal into Zelzal-3, a precision guided missile with a maximum range of 250 km, reducing the margin of error to five meters. Israeli reports estimate the warhead weight of Zelzal-3 to range between 700 and 900 kg. They also speak of other upgrades that included 14,000 Zelzal-2 missiles ⁽²⁵⁾ whose guidance system has been modified to GPS or GLONASS guidance, i.e. the guidance system of Fateh-110.

Rules of Engagement

While the direct confrontation between Hezbollah and Israel has come to a halt, it has been noted that Hezbollah resorted, over the past years, to employing the same tactic it follows in Iraq, i.e. carrying out intermittent missile attacks on the other side of the border with Israel and making little-known groups claim responsibility for them. Examples of such strikes include firing short-range 107-122 mm artillery shells and mortar shells from southern Lebanon on Israel. Overall, 22 rocket attacks from southern Lebanon have been counted in the period between June 2007 and August 2021, with one attack in 2007, five in 2009, two in 2011, one in 2012, two in 2013, and four in 2014.

Some of these attacks – although they were not claimed by Hezbollah – were associated with on-the-ground developments between Hezbollah and Israel. The three 122-mm rocket attack on Nahariyya

in December 2015 is a case in point. While Hezbollah did not claim responsibility for this attack, the fact that it came just one day after an Israeli airstrike on Jaramana that killed Hezbollah member Samir Kuntar suggests it was as a response from Hezbollah. Artillery shelling of the villages of southern Lebanon has been Israel's consistent response to such attacks, without recourse to the air force, particularly given the fact that Hezbollah had not claimed responsibility for all of these attacks ⁽²⁶⁾.

After 2015, rocket attacks from southern Lebanon ceased. Yet they were revived in May 2021 during clashes between the Palestinian factions and Israel, where 13 122-mm rockets were fired from the surroundings of Tyre in Lebanon, toward the northern district of Israel, to which Israel responded with artillery bombardments on the western villages of southern Lebanon.

In July 2021, a striking development in Hezbollah-Israel missile interactions occurred, where two 107-mm rockets were fired from southern Lebanon toward the northern district of Israel. While this strike had minimal impact, mobilization of the Israeli army along the border with Lebanon was remarkable. This attack was interpreted as being a part of Hezbollah's attempt to disperse Israeli efforts, particularly since Iran and Israel have been involved in confrontations against the backdrop of mutual attacks on cargo ships.

This trend reinforced on 4 August 2021, when three rockets were fired from southern Lebanon on Kiryat Shmona, north of occupied Palestine. Israel responded with a heavy artillery shelling on Khiam villages. What is striking in this confrontation was that Tel Aviv seized the opportunity to send a strongly worded message to Tehran in response to the attacks on Israeli oil tankers. The same evening, Israel launched a series of airstrikes on southern Lebanon, which marked an unprecedented development in the Israeli response to missile attacks from southern Lebanon since 2007.

Israeli estimates ruled out the possibility of a response from Hezbollah ⁽²⁷⁾. However, these estimates proved to be incorrect. In a tit-for-tit manner, Hezbollah launched 10–20 Grad rockets from a platform mounted on a civilian truck. These rockets targeted Israeli sites in Shebaa Farms. Notably, Hezbollah claimed responsibility for the attack for the first time, which significantly changes the rules of engagement between Hezbol-

lah – and consequently Tehran – and Israel. Through this attack, Tehran is trying to establish a missile front in southern Lebanon, similar to its fronts in Iraq, Yemen, and Gaza, as one of its tools of interaction with the international community.

In view of the comprehensive analysis of Iran’s regional proxies in Yemen, Lebanon, Gaza, and Iraq, a number of indicators can be highlighted:

Iranian use of proxies: Seemingly, Iran’s proxies have considerable missile capabilities through which Iran can put pressure on countries it has to confront. The capabilities of these proxies vary considerably. For instance, the missile capabilities of Hezbollah and the Houthis are larger and more complex than those of the Popular Mobilization Forces and Gaza factions. That said, we cannot turn a blind eye to the fact that each proxy has its own domestic, regional, and logistical interests that may limit the effectiveness of their role in Tehran’s regional equation. So, Iran must take these interests into consideration so it can continue to have influence on these political and military proxies.

Hezbollah’s role in transferring expertise: What is remarkable about the relationship between the four actors dealt with in this chapter is the exchange of field and technical missile experiences between them. Hezbollah was the fundamental part of this equation given its considerable experience and long-drawn-out confrontations with Israel in 2006, which enabled it to transfer its technical and field expertise at all military levels to other proxies in the region, from the Palestinian factions in Gaza to Popular Mobilization Forces in Iraq to the Houthis in Yemen.

As far as its missile capabilities are concerned, Hezbollah’s strength derives from the secrecy of its qualitative missile capabilities since 2006, causing it to remain a subject of controversy. In addition, Hezbollah’s missile force has not been used extensively since 2006, which has given Hezbollah plenty of time to develop its capabilities and increase its rocket stockpile, an advantage that was not available to the Gaza factions that got engaged regularly in rocket confrontations with Israel, which caused depletion in their human and material resources as well as the stockpile of locally manufactured missiles.

Naturally, missile engagement is a decision of the financier. However, in the case of Iran, it does not have full control on one of these actors: the Iraqi proxy. This straitjacket is unique to the Iraqi actor. Indeed, the Shia

in general, and Popular Mobilization factions in particular, have differing views on Iran's policy in Iraq. These views are affected by the economic and political conditions in the Iraqi interior. This trait may also extend to the Lebanese proxy, as Hezbollah is the key political player in the country and the internal situation must be carefully considered before it opts for escalation. Perhaps this played a role in Hezbollah's refraining from direct engagement with Israel in 2008.

In conclusion, the wide variances between Iran's regional proxies in terms of their missile capabilities, field circumstances, and the political context in which they operate pose persistent challenges to Iran at the logistical and tactical levels, let alone other challenges that may arise in the event of reaching a regional settlement that requires Iran to back away from supporting certain proxies or reduce its support to them, a situation that would be strategically damaging in the long term. As such, this equation remains the most important for Tehran to consider in the foreseeable future.

References

1. Shaan Shaikh, Iranian Missiles in Iraq ,Center for Strategic and International Studies, December 11, 2019.
2. Farzin Nadimi and Michael Knights, Militias Parade Under the PMF Banner (Part 2): Ground Combat Systems, The Washington Institute for Near East Policy , Jul 3, 2021.
3. Shaan Shaikh, Iranian Missiles in Iraq ,Center for Strategic and International Studies, December 11, 2019.
4. Farzin Nadimi and Michael Knights, Militias Parade Under the PMF Banner (Part 2): Ground Combat Systems, The Washington Institute for Near East Policy , Jul 3, 2021.
5. Michael Knights and Crispin Smith, Kataib Hezbollah Leads Drone Warfare Inside Iraq, The Washington Institute for Near East Policy, May 14, 2021.
6. Robert Tollast and Sinan Mahmoud, Drone attacks in Iraq point to new Iranian strategy, the National, Jun 7, 2021.
7. Hamdi Malik and Crispin Smith, The Drones of Kataib Hezbollah's Jazira Command, Center for Strategic and International Studies, Jul 20, 2021.
8. Ian Williams and Shaan Shaikh, The Missile War in Yemen, CSIS Missile Defense Project, June 9, 2020.
9. Stijn Mitzer and Joost Oliemans, Houthi Drone and Missile Handbook, oryx spioenkop blog, September 06, 2019.
10. Stijn Mitzer and Joost Oliemans, List of Iranian Arms and Equipment Supplied to Houthi Militants in Yemen since 2015, oryx spioenkop blog, September 25, 2019.
11. MICHAEL KNIGHTS, The Houthi War Machine: From Guerrilla War to State Capture, COMBATING TERRORISM CENTER, SEPTEMBER 2018.
12. Stijn Mitzer and Joost Oliemans, Houthi Rebels Unveil Host of Weaponry, Compounding Drone and Missile Threat, oryx spioenkop blog, March 12, 2021.
13. Stijn Mitzer and Joost Oliemans, Houthi Drone and Missile Handbook, oryx spioenkop blog, September 06, 2019.
14. Ian Williams and Shaan Shaikh, The Missile War in Yemen, CSIS Missile Defense Project, June 9, 2020.
15. Franconia, Nick. "HAMAS's Military Capabilities after the Gaza Takeover." Washington Institute for Near East Policy, Policywatch, 2007.
16. Weiss, Margaret. "Weapon of Terror: Development and Impact of the Qassam Rocket." The Washington Institute for Near East Policy, 2008.
17. Reich, Bernard, and David H. Goldberg. Historical dictionary of Israel. Rowman & Littlefield, 2016.
18. Weiss, Margaret. "Weapon of Terror: Development and Impact of the Qassam Rock-

- et.” The Washington Institute for Near East Policy, 2008.
19. Gormley, Dennis M., and P. CLARKE COLIN. “Missiles in the Middle East: their destabilizing role: Dennis M. Gormley, Colin P. Clarke, and Jürgen Altmann.” *Arms Control and Missile Proliferation in the Middle East*. Routledge, 2012.
 20. Dion Nissenbaum, Sune Engel Rasmussen and Benoit Faucon, *Hamas Builds ‘Made in Gaza’ Rockets and Drones to Target Israel*, *The Wall Street Journal*, May 20, 2021.
 21. *Missiles and Rockets of Hezbollah*, CSIS Missile Defense Project, August 10, 2021.
 22. Makovsky, David, and Jeffrey White. *Lessons and implications of the Israel-Hizballah war: A preliminary assessment*. Washington Institute for Near East Policy, 2006.
 23. Wilkins, Henrietta. *The making of Lebanese foreign policy: Understanding the 2006 Hezbollah-Israeli war*. Routledge, 2013.
 24. Andrew Exum, *Hizballah at War: A Military Assessment*, The Washington Institute for Near East Policy, Dec 21, 2006.
 25. *Missiles and Rockets of Hezbollah*, CSIS Missile Defense Project, August 10, 2021.
 26. Byman, Daniel. “The Lebanese Hizballah and Israeli Counterterrorism.” *Studies in Conflict & Terrorism*, 2011.
 27. Zisser, Eyal. “Hizballah and Israel: Strategic threat on the northern border.” *Israel Affairs*, 2006.

Conclusion

Missile force data in the Middle East under study in the book forthrightly reflects a state of increasingly mounting concern in the future about the state of regional security unaccompanied by missile arms controls.

The analysis of the outcome of the capabilities indicators that were reviewed, undoubtedly confirms that there is a direct relationship between the surge of the stockpile and the development of capabilities at an accelerating rate on the one hand, and the escalation of intensive use on the other hand.

This force has turned into a “destructive dynamics” for the state of regional stability. These concerns are augmented by the lack of effective international or regional mechanisms that can curb the disarray in the possession and use of missile forces, or even diminish their possession to states in a controlled manner, if we take into account the capabilities and expertise of non-state actors, including armed factions, rebel groups, and extremist groups as well.

The essence of the key imbalance in the case of missile armament in the Middle East is closely related to the perspective of regional powers to possess strategic deterrence capabilities, especially since missile force is the next deterrent one after nuclear power, excluding chemical and biological ones.

Those who do not possess nuclear power seeks, in return, to achieve a bit of balance in the face of those who possess nuclear power by owning a stockpile-rich missile force to achieve launch density while covering

all possible ranges with the aim of achieving the deterrence factor, which applies to Iran in particular due to the weakness of its air force.

Nuclear states such as Israel are also interested in owning a field missile force as a means of carrying nuclear warheads; a target Iran also wants to achieve, as it may become a nuclear state. Iran's possession of a nuclear bomb will dramatically change the nature of the balance of armaments forces in the Middle East, and will consequently generate vehement arms races that will exceed the ceiling of conventional armaments as is the case in missile arms races.

Currently led by the United States heading to Asia within its strategy of dual containment of China and Russia, the ongoing changes taking place in the global system are largely reversed. At the forefront of these repercussions is the emergence of a defense gap for Washington-allied Arab powers in the Gulf, as part of the defense vulnerability in the region. This gap gives Iran a preeminent margin to increase the level of the missile threat in the region, whether ballistic or through drones, and whether on its own behalf or through the proxy war by the Houthis in Yemen, Hezbollah in Lebanon, or its affiliated militias in Iraq and Syria.

The US brandishing of (Abraham Accords) solutions will not be the appropriate alternative. On the contrary, it may have negative repercussions that could help increase the Iranian motivation and hostility to the countries of the region.

Armament experts who participated in this book expect that the path of missile armament at the level of development and increasing stockpiles is an extended path and there is no return point in light of the projects of some regional expansionist powers. Rather, the most likely scenarios indicate that this situation could help double these capabilities, either by self-manufacturing, co-manufacturing or by purchasing from arms exporters market that is growing in parallel with space armament systems, satellites, smart missiles and cyber warfare.

On the other hand, it is necessary to look at the rational forces that pursue the strategy of "silent deterrence", as they do not abandon the achievement of the deterrence factor by possessing missile capabilities that achieve this goal for them, without engaging in conflicts or crises. Just as missile power is a destructive force; it can be unquestionably used in useful fields, especially in the field of space in light of the communications and information revolution.

This book is the product of several sensible scientific studies by a group of weapons experts in Egypt, dealing with missile power in the Middle East, in all its dimensions and details, in terms of the map of proliferation and the various missile abilities and capabilities, their sources, and developments. Furthermore, the book deals with the use of missile power in the complex regional equations of engagement with the outbreak of war and the sustainability of armed conflicts, which reveal an ever-increasing frequency of missile used, making the Middle East the first region of the world to use this dangerous force of weapons.

The book highlights strategic abstracts, perhaps most notably that there's a case of a "missile arms race" in the region, since some regional powers, in particular Iran, rely on the status of missile power as an offensive tool in the territorial expansion of conflict zones, has led other regional forces in the Arabian Gulf, such as Saudi Arabia and the United Arab Emirates, to seek defense alternatives, while other countries, like Israel and Turkey, opted to improve and develop their missile capabilities. In general, however, there is a situation of defensive exposure in the region, leading most regional parties without exception to resort also to improving defense capabilities through the acquisition of more sophisticated missile defense systems and the construction of multi-layer systems to deal with different missile threats, but a gap remains.

The group of experts concluded that the missile power file in the Middle East had political dimensions relevant to the current liquidity situation in the international system and that shifts in the global power structure had reverted to regional security in the Middle East as the United States proceeded to divert most of its military assets in the Middle East, particularly its missile systems, to Asia, intensifying concern about the situation of missile defense exposure, before the situation on the Iranian missile program was resolved, or establishing controls for the state of missile arms control, which the Middle East lacks.



ISBN 978-977-86041-5-3

