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The Evolution of Missile Politics in the Middle East

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Abstract

Advanced ballistic and cruise missiles have become a salient feature of the Middle Eastern security landscape. More regional states are either developing indigenous production capabilities or importing missiles than ever before and their use has also become a frequent occurrence in regional conflicts. The chapter surveys the historical and contemporary missile landscape in the Middle East charting its evolution and trajectory and identifying some key region-wide trends. The chapter argues against adopting a deterministic approach that confines the region's missile dynamics to an inescapable arms race based on unique regional features. Instead, it explores the multiple dimensions of the region's approach to missiles through exploring variable drivers, changing historical phases as well as the impact of global patterns of diffusion whether of missile defence or offensive systems.

Keywords: Middle East; missiles; regional competition; arms race

1. Introduction

On the surface of it, the Middle East appears to be entering the missile age anew. Several states have made recent significant investments to develop, refurbish, expand and sometimes to start afresh their missile programmes. Additionally, missiles have recently become more intertwined in regional conflicts as shown in conflicts in Iraq, Syria and Yemen among other places. They are also frequently referenced in discussions about regional nuclear threats and had featured prominently in debates around the Iran nuclear deal. This chapter seeks to capture some of the key missile trends in the region as well as looking underneath the surface to capture some of the longer historical trends as well as contextualizing regional missile politics. The chapter argues against adopting a deterministic approach that confines the region's missile dynamics to an inescapable arms race based on unique regional features. Instead, it explores the multiple dimensions of the region's approach to missiles through exploring variable drivers, changing

historical phases as well as the impact of global patterns of diffusion whether of missile defence or offensive systems.

In examining regional missile politics, the chapter focuses on advanced missile including both ballistic and cruise missiles. In limiting its inquiry to advanced missiles, the chapter focuses ballistic and cruise missiles of ranges exceeding 250 Kms. While range is a metric frequently used to classify missiles, it is worth noting that the range of any missile is also influenced by its fuel capacity and its trajectory, among other things. The value and reach of the 250 Km range can vary in different sub-regional settings but is used here as a rough metric indicating the ability to target across borders, as well as a reflection of a degree of technical capability. Range is only one feature of missiles that are worth tracking, other features such as accuracy are very relevant and regional missiles appear to be making significant advances on that front too corresponding to global advances on missile accuracy. However, public information enabling a thorough assessment of accuracy profiles of variously missile systems is not available. Therefore, missile range, alongside programmatic variables, becomes a good proximate indicator for advanced missiles.

This chapter is divided into two main parts. The first part provides a snapshot into the regional landscape of ballistic and cruise missiles of ranges exceeding 250 Km. The focus in this section is on presenting some of these holdings through tracing key regional missile players. In providing that snapshot, the chapter focuses on diverse capabilities and the material infrastructure of missile power in the region but also reveal features of dynamism and change in that evolving landscape. The second part builds on that survey to provide a critical examination into some of the dominant perspectives informing how regional missiles have been studied. It also provides insights into the diversity of drivers, historical evolution as well as evolving nature of missile politics in the region.

2. Advanced missile programmes in the Middle East

There are 11 states in the Middle East with either ballistic or cruise missile holdings of over 250 km in range.¹ They differ significantly in terms of their capabilities, history and defence doctrine. The review below will focus on some of the key state actors that are considered significant based on their current holdings or historical interest in missile technology. They show diverse profiles and also a lot of variance in their material capabilities, ambitions as well as achievements. Some are making big investments into their programmes while others only hold old, sometimes legacy systems, with their missile programmes in decline despite some advanced holdings. In the latter group, countries such as Syria, Libya and Yemen can be included but their stockpiles has been made less relevant and in some cases depleted on account of internal conflict and civil war.

Among all the states in the region, Israel stands out as the most advanced missile regional power with an indigenous programme capable of producing missiles of considerable range and accuracy. Iran has significant local production capabilities and stands out on account of the diversity of platforms it has produced despite stringent sanctions and opposition from key western states. Other states with active programmes rely predominantly on imported systems that differ in their origin and are therefore subject to the willingness of supplier states to provide

¹ There are various definitions of the Middle East. In this chapter, the Middle East will be defined to include 22 members of the Arab League in addition to Israel, Iran and Turkey.

those systems. This includes the majority of other regional missile powers with missile holdings but two stand out based on their recent ambitions to produce an indigenous missile production base: Turkey and Saudi Arabia. But states are not the only actors in the region. Two non-state actors also have the capability to operate and launch missiles with increasing accuracy and ranges above 250 km. The analysis below shows some of the key regional actors including state and non-state actors.

Israel

Israel's interest in ballistic missiles began in the 1950s and it started a concerted effort in 1963 to develop its first credible ballistic missile system with French assistance (Isnard 1996). Building on its increasingly advanced aerospace industry and focusing on developing superior technology to account for the quantitative limitations of its armed forces, Israel was able to deploy its first short-range ballistic missile, the *Jericho-1*, by 1973 despite France terminating its support before the under-development system was complete. Israel is assessed to operate short-medium and possibly intermediate-range ballistic missiles (SRBM, MRBM and IRBM respectively) for both conventional and nuclear deterrence. Israel is widely believed to operate a nuclear triad and has the capacity to deliver nuclear weapons from air, land and sea platforms (Kristensen and Norris 2014). However, due to Israel's policy of nuclear ambiguity, it is difficult to ascertain with certainty the capabilities of the different systems and platforms that Israel has allocated for nuclear weapons delivery, especially the range of these systems and their respective throw weights.

It is believed that the land leg of Israel's nuclear triad consists of at least one variant of the *Jericho* series of ballistic missiles. The *Jericho II* is a MRBM likely with a range of 1,800 km, placing around half of Iran, including Tehran, within range. The *Jericho II* is thought to be capable of carrying payloads up to 1,000 kg. Israel is known to have tested a successive, longer-range system, known as the *Jericho III*, which may be based on the *Shavit* space-launch vehicle (SLV).² Whether this latest iteration has entirely replaced the *Jericho II* is unknown, but experts have suggested it is capable of striking targets around 4,000 km distant with a 750 kg warhead (Jericho 3 2017). This longer-range system places all of Iran with the range of Israel's ground-based systems and also possibly other states with nuclear capabilities that some experts have suggested Israel may hedge against, such as Pakistan (IISS 2021a).

Israel also possesses several types of indigenously developed cruise missiles, such as the *Delilah* and *Popeye* series that are utilised across different Israeli land, air and sea platforms, providing it with the capability to conduct precision strikes (IISS 2021b). Israel also allegedly operates a conventionally-armed SRBM, the Long Range Artillery (LORA).

Iran

What distinguishes Iran's missile capability regionally, as with Israel's, is its development of a local production and design capacity that gives its missile programme relative autonomy from external suppliers, although Iran still receives some foreign technical assistance, especially from China and North Korea (Green and Roth 2021). The experimental nature of some Iranian missile designs might account for the limited appearances of some systems, not of all which are believed to be in service. Of those that are known to be deployed, several variants, especially

² Information on the *Jericho III* system is limited. While it is expected to have a longer range that comes close to the range of ICBMs, authoritative information on the exact range is not available.

those deriving from Iran's liquid-fuel missile programme, share a common ancestry derived from its earliest acquired ballistic missiles technology (IISS 2021c). For instance, the *Shahab* series are known to be copies or variants of the Soviet-designed *Scud-B*, which Tehran acquired from Libya and North Korea during the Iran-Iraq war. Despite some of the drawbacks associated with liquid-fuel missile technology, Iran has continued upgrading existing systems within its inventory and develop new systems but with an emphasis on improving accuracy (Savelsberg 2020). Iran has developed at least eight different types of liquid-fuel missile, ranging from short-range systems, such as the *Shahab* and *Qiam* variants, to medium-range systems such as the *Emad* and *Khorramshahr* (see table 2) (IISS 2021c).

Iran also possesses solid-fuel ballistic missiles, such as the short-range *Fateh* variants. It is also developing medium range systems such as the *Zolfaghar*. Solid-fuel missiles provide users with some advantages over liquid-fuelled systems as they can be launched faster, minimising the possibility for an adversary detecting and pre-emptively targeting them, thereby improving the system's survivability. Accurate estimates of the range of Iran's various ballistic missile designs are difficult to confirm but it is believed that some designs are capable of travelling up to 2,000 km. Iran has a self-imposed range limit of 2,000 km that is attributed to Iran's Supreme Leader, Ayatollah Ali Khamenei (Gambrell 2017). Whether Iran will adhere to this range-limit in the future is unknown.

To complement its ballistic missile arsenal, Iran is also developing and diversifying its cruise missile capabilities. This effort began with Iran's covert acquirement of six Soviet-designed Kh-55 (RS-AS-15 *Kent*) cruise missiles from Ukraine in 2001 (Kerr 2005). Several names are associated with development efforts based on this airframe including *Meshkat*, *Soumar* and *Hoveizeh*. Producing a land-attack cruise missile on the basis of the Kh-55 has been hampered by the lack of an adequate engine. As well as a Kh-55 derived missile, where the ambition was to produce a 2,000km plus class weapon, Tehran has also developed the 351/*Quds* cruise missile. This is a shorter range and simpler weapon, but that has proved operationally effective.

Turkey

Turkey has a very different military profile compared to other regional states. It is a member of a key formal military alliance NATO which gives it privileged access to integrated military planning with US and other European powers with advanced military industries. Noteworthy is Turkey's hosting of NATO nuclear weapons, however, these use air force for delivery rather than missiles. Recently, Turkey has started diversifying its defence procurement partners and also expand on its indigenous and domestic military production. The most noticeable feature here is their development of a significant programme for the production of military drones. Turkey is also developing several indigenous SRBMs, some of which draw on Chinese technology and assistance (Egeli 2017). Ahead of the Russian invasion, Turkey was also cooperating with Ukraine to procure propulsion units for an under-development sea-launched cruise missile (SLCM) named *Gezgin* (Sabah 2020). Turkey has also produced an indigenously designed air-launched cruise missile, SOM (Stand-Off Missile), which has reportedly been in service with the Turkish Air Force since 2015 (Defence Turkey 2021).

Saudi Arabia and other GCC

Like Turkey, Saudi Arabia has recently invested in domestic missile production base as part of an overall drive to develop its own local military industries fueled by the ambition of its

crown prince and de facto ruler Mohamed Ben Salman. Its partners in developing its missile capabilities extends beyond its traditional military partners the US and UK where the bulk of its military procurement takes place. Saudi Arabia currently possesses two ballistic missile systems of Chinese origin, the liquid-fuelled DF-3 (CH-SS-2) and the solid-fuel DF-21 (CH-SS-5). These systems have ranges of 3,000 km and 2,000 km respectively (Lewis 2014). These systems constitute the core of Saudi Arabia's Strategic Missile Force, which Riyadh might also be seeking to expand further given evidence that Saudi Arabia appears to be constructing a facility to produce solid-fuel missiles domestically and procure a Ukrainian-designed SRBM (Sonne 2019; Malyasov 2019). Saudi Arabia also possess the British-French *Storm Shadow*/SCALP ALCM, which it purchased in 2011 (Lewis 2011).

Other GCC states including Bahrain, Qatar and the UAE also possess small ballistic missile arsenals from a variety of origins (Senear 2018). Bahrain, Kuwait and UAE all possess cruise missiles of western origin. The UAE also appears to be building its domestic industry to produce advanced weaponry (IISS 2021b). This has included cooperation with external defence firms, such as South Africa's Denel and the development of stand-off munitions by Emirati firms such as HALCON Systems.³

Egypt

Historically Egypt was an early regional entrant into the missile age with plans to develop its own missile capabilities in the 1960s (Sirrs 2006). Two missile models were tested in 1963 but without much success due to in part lack of sufficient investment and problems with developing a competent guidance system. Egypt relied instead on importing Scud missiles from the Soviet Union with the aim to match Israeli air force to hit Egyptian cities. Efforts for indigenous development slowed down in subsequent decades but was revived in the 1980's through a joint venture with Argentina and Iraq, known as the Condor II project, which ultimately did not come to fruition (Sirrs 2006). Egypt's current ballistic missile arsenal includes a stockpile of legacy *Scud* missiles of Soviet origin. More recently, Egypt acquired air-launched cruise missiles (ALCMs) with a range of 250 km from France. While historically, Syria, Libya and Yemen once had considerable ballistic arsenals, these have been significantly eroded due to use and lack of maintenance in their respective civil wars (Reuters 2015).

2.1. Regional non-state actors

States are not the only regional actors with missile capabilities and ambitions. The growing prominence of non-state actor's missile arsenals has become one of the new features of the region's missile landscape and some groups are demonstrating remarkable capabilities considering their relatively limited resource bases. Without the capacity to operate significant air or maritime forces and project power beyond their immediate environment, these groups find value in using missiles as a way to target adversaries' military forces, population centres and critical national infrastructure to inflict military and political damage (Mushin 2019). These groups have also developed a limited capacity to handle and reassemble dismantled missiles sent from state backers, which has eased the difficulties associated with transporting large systems intact.

³ HALCON Systems, 'HAS-250 Anti-Ship Missile', <https://media-files.edgegroup.ae/s3fs-public/2021-02/HAS-250%20ANTI-SHIP%20MISSILE%20EN.pdf>

Two sub-national groups in particular stand out when it comes to missiles: *Hezbollah* in Lebanon and the *Houthis* in Yemen. Both proxy groups have strong links to Iran with *Hezbollah* also having close ties with the Syrian government. They have both managed to build up an arsenal of missiles, although information about their holdings, particularly that of *Hezbollah*, is difficult to verify.

Hezbollah's extensive arsenal contains a variety of different types of systems of different ranges, roles and level of guidance. The group is estimated to possess perhaps as many as 130,000 rockets and missiles in total, a nearly nine-fold increase in the number of systems it possessed during the 2006 Lebanon War (Shaikh and Williams 2018). The vast majority of these are rockets of a comparatively simple design but by significantly increasing the size of its arsenal, *Hezbollah* may be able to severely pressure Israeli air and missile defences in a future conflict and complicate and overextend Israeli counter-force targeting capabilities (Times of Israel 2021). As well as expanding the number of unguided rockets it possesses, *Hezbollah* is also improving the range and accuracy of some systems, such as the *Fateh-110*, to conduct increasingly accurate strikes that will could be used to target large Israeli military or civil installations (Kenner 2018). The group has benefited from its links with Iran and the opportunities that came with *Hezbollah's* involvement in the Syrian civil war to expand the size and lethality of its arsenal through technology transfers from state backers. Israeli assessments indicate that *Hezbollah* has the ability to produce guided surface-to-surface missiles but identified problems with the group's ability to mass produce them (Kubovich 2019).

Houthi stockpiles are more verifiable given their frequency of use against the Saudi-led coalition and regular public displays for propaganda purposes. Moreover, with the collapse of the Yemeni President Muhammed Saleh's government, the *Houthis* were known to have taken control of significant portions of the government's missile stockpiles, including *Scud* and OTR-21 *Tochka* (RS-SS-21 *Scarab*) SRBMs (Browning 2016). In addition to capturing Yemeni government stockpiles, the group has domestically manufactured unmanned aerial vehicles (UAVs) as well as some guided and unguided rockets, such as the *Badr-1P* and the *Badr-F/Nakkal* (Hinz 2021). The *Houthis* have also managed, through Iranian mentorship and assistance, to reassemble illicitly transferred ballistic and cruise missiles (UNSC 2021).

The evolution of the *Houthi's* missile inventory is reflected in their increasing ability to strike targets deep into Saudi Arabia. Prominent early missile attacks against the Saudi-led coalition, for instance, utilised SRBMs which the *Houthis* were known to have acquired from Yemeni government sources (BBC 2015; Fahim 2015). However, subsequent attacks against targets in Saudi Arabia attributed to the *Houthis*, such as missile attacks against Riyadh in 2018 and the 2019 attack against Saudi Aramco facilities, used ballistic and cruise missiles that exceeded the range and type of known Yemeni government stockpiles (Reuters 2021). It is therefore highly likely that some of these systems are of Iranian origin (IISS 2020a). As well as supplying missiles to non-state actors, however, Iran also appears intent on enabling all its main proxies to be able to autonomously manufacture artillery rockets and precision-guided missiles (Hinz 2021).

3. Making sense of regional missiles politics

How can we make sense of the patterns of missiles acquisition in the Middle East? As the above survey showed, several states are making investments in developing and acquiring missiles. The majority of the analytical attention is directed towards Iran's missile programme as well as non-state actors activities. Both are significant part of regional missile developments, but such a narrow focus ignores other important elements of the regional landscape. Indeed, one can discern a competition between Israel and Iran in the missile field but the historical origins of Israel's programme and its trajectory has developed independent of Iran's much later programme and likely to be looked beyond that. The rivalry between Saudi Arabia, and some other Gulf states such as the UAE, and Iran is also a factor in spurring competitive military build-up but can these rivalries and competitive dynamics be considered a regional arms race of missiles driven by action-reaction alone? How best to conceive of the regional dynamics and how best to reflect on the study of regional missiles?

3.1. Critical reflections on the study of regional missiles

Interest in studying the development and acquisition of missiles in the region has followed a cyclical pattern where the issue can move in and out of the spotlight. At one point, the issue of regional missiles can become 'one of the most pressing issues in international security' (Karp 1995). Then at another point, it can sink into 'near invisibility' where it occupies only a marginal space (Karp 1995). To a large extent, cycles of academic interest in regional missiles has carried a number of features that still shape current approaches to the topic.

The highpoint for regional missile literature came as the shadow of the Cold War was receding and with it the military, economic and ideological confrontation between the US and the Soviet Union. Security Studies started to increasingly direct its gaze towards situating 'security' within a regional context (Buzan and Hansen 2009). As part of this re-focusing, regional arms dynamics particularly for advanced weapons systems and missiles grew in significance (Fetter 1991; Nolan 2010). Interest in the politics of missiles also coincided with the growth of the literature on nuclear proliferation that also had in the post-cold war days a strong regional focus.

Interestingly, most of this literature on the spread of missiles during this period focused on the threat of missile proliferation to Third World countries (Karp 1988; Eisentein 1982). The underlying assumption was that such missiles, which had been limited to a small number of industrialized states, will be 'even more worrisome' in the Third World and could more easily lead to war (Nolan and Wheelon 1990). Within this framing, the Middle East was seen as a particularly significant region. As Seth Carus referred to it, the Middle East was the 'most dangerous area for missile proliferation' (Carus 1991, p.12). In general, the literature was alarmist in tone and speaking to growing interest in restricting access to missile technology to a new profile of actors: regional authoritarian states (Miller 1989).

In many cases, studies of regional missiles reflected an external extra-regional view where the unique features of the region as inherently unstable or uniquely militaristic commonly prevails. These assumptions can find root in ethnocentric assumptions that are embedded in strategic and security studies and reinforced by the Anglo-american origin of the discipline where

projecting 'otherness' onto different regions of the world is a common practice (Buzan and Hansen 2009). But one can also trace cycles of interest in regional missiles to correspond to expressed policy interests by the great powers outside the region in seeking to understand and influence missile developments in the region. In making these observations, the chapter invites scholars to be reflexive about the assumptions incorporated into the study of the topic as well as engage critically with proclamation of detached analytical objectivity in approaching regional arms dynamics.

Regionally, Iraq became the poster case summing up strong interest in missiles development and the consequences that entails. Iraq, then Iran, had used ballistic missiles in the Iran-Iraq 'war of cities' that was also linked to the use of chemical weapons (McNaugher 1990). But Iraq's missiles came to prominence after its invasion of Kuwait and its clash with 'the new world order'. During the conflict, Iraq launched ballistic missiles against Israeli and Saudi cities triggering wide interest in engaging with regional missile acquisitions and use (Carus 1991). This was followed by a period that saw the issue of regional missiles recede into relative oblivion as described by Aaron Karp in his 1995 survey (Karp 1995). The issue saw a later revival as a new wave of regional interest started to take hold and in particular with the growing advances achieved by Iran's quest for missiles. This body of literature also drew on growing understanding of some of the missile proliferation networks that was revealed as Libya renounced its WMD programme and in the process shedding more light on the workings of the AQ Khan network (Corera 2006; IISS 2007). This also extends to the development of a more nuanced understanding of the role DPRK played in the spread of regional missiles to the region and how that role has evolved (Pollack 2011).

A significant part of the new and contemporary literature took place in the shadow of Iran's missile programme (Elleman 2015; IISS 2010). The literature seldom expanded its focus beyond the policy problems emanating from Iran's fast advancing missiles programme. In this context, interest in wider regional dynamics took a backseat or provided the context for interest in Iran's missiles (Bahgat 2019). The polarisation of the US debate around the Iran nuclear deal between Democrats and Republicans added to the attention politically partisan think tanks paid to the issue of missiles. In particular, several of the conservative-leaning research centres criticized the deal due to the lack of effective controls over Iranian missiles including the Heritage Foundation and the Washington Institute for Near East Policy (Eisenstadt 2015; Brookes and Philips 2021; Philips and Brookes 2021). But that focus is expanding with growing policy interest on missile developments on a global scale and this has been reflected in at least two high profile initiatives: the Missile Dialogue Initiative run by the International Institute of Strategic Studies (IISS) and Missile Defense Project at the Center for Strategic and International Studies (CSIS) both of which address the Middle East missile landscape within a global context.

3.2. Waves of regional interest in missiles

In surveying the regional missile landscape, history can provide us with a longer view of patterns of regional dynamics that can challenge conceptions of immutable unchanging rivalries. Such a view can present a more complex, contingent trajectories as well as different phases of missile competition. One can discern three chronological episodes of interest in advanced missiles in the region that can be grouped as successive waves. While such waves have cross

overs and continuities between them, each presents its own set of dynamics that are distinct in character. Each therefore provides a useful roadmap to understanding the longer trajectory of interest in missiles in the region.

The first wave represents the start of the missile age in the Middle East and unfolded during the 1950s and 1960s at the height of the clash between Israel on one hand and assertive Arab nationalism on the other hand. The two key actors in this first wave were Israel and Egypt. Israel started to experiment with rockets and ballistic missiles in the late 1950s and launched its first missile test of 'Shavit II' in 1961 (presented at the time as an experimental weather rocket) (Cohen 1998). This was followed by close technical collaboration with the French that led to efforts to produce a joint ballistic missile system under the name of 'Jericho'(Cohen 2010). Cooperation with France stalled following the 1967 Arab-Israeli war that resulted in Israeli occupation of Arab territories in 1967. This drove Israel to develop its own indigenous missile production base from the 1970s onwards in lieu of previous reliance on French assistance (Bahgat 2019).

Around the same time that Israel started to explore and develop missiles, Egypt was developing an indigenous ballistic missile programme from the late 50s. Such efforts increasingly relied on the recruitment of German scientists and technicians to contribute to an nascent Egyptian missile programme. The high point of such early programme came with public display of missile tests in 1962 with President Nasser and the top echelon of Egyptian military establishment in attendance and extensive coverage by the local press of the event. Two ballistic missiles models called Al-Kahir and Al-Zafir were tested. However, the programme ran into financial and technical difficulties related to developing guidance and had achieved little tangible progress before being scaled down in the latter part of the 1960s (Sirrs 2007, pp.33-35; 155-156).

The 1970s and 1980s saw a second wave of regional missile interest which saw on one had the demise of Nasser's project and on the other hand the emergence of a number of Arab leaders vying to inherit his pan-Arab leadership position. The second wave saw a considerable expansion of the missiles club in the region. To a large extent this was facilitated by the availability of missiles for purchase. Iraq, Libya, Syria among others started to purchase ballistic SCUD missiles from the Soviet Union and Saudi Arabia from China (Potter and Stulberg 1990). The Iran-Iraq war 1980-1988 was a key flashpoint that spurred significant investment in ballistic missiles by both sides of that conflict but also other regional states. Iraq invested in building variants of its SCUD stockpile including 'Al-Hussein'. Iran, through assistance from Libya and Syria, also acquired ballistic missiles. The result was the exchanges that came to be known as the 'war of the cities' (Segal 1988). It was also during this period that Saudi Arabia, after being rebuffed by the US as the traditional source of armaments, managed to acquire DF-3 missiles from China with range 750–4,000 km (Russell 2001). There were some indigenous efforts to develop an industrial missile base throughout this wave. Iraq and Egypt in the 1980s ran a secret programme in cooperation with Argentina aimed at missile development that was rolled back after its discovery (Sirrs 2007). Israel cooperated with South Africa in missiles development and produced Jericho II

during the 1980s (Kristensen and Korda 2022). It was this wave of regional interest that in part spurred the establishment of Missile Technology Control Regime (MTCR).⁴

The second wave ended with the destruction of Iraqi missiles with ranges below 150 km following Security Council Resolution 687 and the work of UNSCOM. A third wave started following the US and allied invasion of Iraq in 2003 onwards with spill on effects on regional security. This period saw the rise of Iranian influence in the region and a growing role for non-state actors. These dynamics and reactions to them, continue to shape the regional landscape today and many of its features and profile of actors was addressed earlier in this chapter.

3.3. Diverse regional drivers and motives

Whereas the arms race term might indicate the primacy of a deterministic action-reaction, a consideration of drivers reveals that regional competition, always changing in nature, are embedded in diverse motives and considerations. An understanding of the diversity of drivers can help us move away from images where states are locked into competition or rivalry. Interest in missiles in the region developed in response to multiple needs and with time domestic constituencies of support developed to sustain that interest. While missiles can be frequently seen as a force multiplier by regional states enabling force projection outside their borders. An important part of their appeal has been through addressing the chronic inability by regional states to develop a competent and effective air forces leaving them vulnerable to defenseless air attack without capability for retaliation.

For example, Egypt's early forays into missiles came partly as a response to an inadequate air force, that was expensive and challenging to build up and maintain as well reliant on foreign suppliers for jets, training and spare parts. This left Egypt with far less capability to retaliate against Israel which had an air force superior in range and fighting power. A similar logic applied in the case of Iraq fueling its interest in missiles particularly when it needed to reach deep into Iranian territory in the Iran-Iraq war. Iraq, faced with US air supremacy, resorted to missiles to attack US regional allies, Israel and Saudi Arabia, in 1991 (Fetter 1991). Elements of this dynamic are applicable to Iran whose ability to maintain and run an advanced air force is hampered by financial as well as technical difficulties. This is further exacerbated by sanctions and reliance on foreign suppliers that for a long-time hindered Iran's ability to service or update its air force (Bahgat 2019). In this context missiles are seen as an essential equalizer for Iranian military. In retaliation for the assassination of Qasem Soleimani the former head of the Islamic Revolution Guard, Iran used ballistic missiles to strike back at the US with highly accurate precision. Iran launched a missiles attack on two US bases in Iraq (in Irbil and Al Asad, west of Baghdad) using 13 mid-range ballistic missiles between 15-22 ballistic missiles (Eslami and Vieira, 2022). The same also apply with varying degrees to other regional states, where missiles are considered a more accessible way of extending their military reach. Overall conventionally-armed missiles are widely considered as legitimate and acceptable tool for deterrence and also retaliation. In the case of Israel, the utility of missiles is also tied to their ability to act as possible delivery vehicles for its nuclear weapons (Kristensen and Korda 2022).

⁴ The MTCR is a voluntary control regime that was established in 1987 to limit the spread of ballistic missiles, technologies related to them as well as unmanned delivery vehicles that could be used to deliver weapons of mass destruction

But these roles are not the only or dominant roles for missiles in the region. Missiles have also acquired symbolic meaning that ascribes additional value to them beyond strict military utility. Missiles are frequently used in military parades and valorised as a key national asset symbolizing technological prowess, autonomy and national strength. In that sense, they sometimes play an important role as symbols and markers of strength and sometimes even defiance in front of a domestic audience but also an external audience (Israel and Paikowsky 2017; Eslami and Vieira 2020). This ascribes an additional layer of value to missiles that need to be considered when thinking about how to de-value them in the context of arms control. Furthermore, the financial, technological and reputational investment made in missiles can result in the creation of bureaucratic constituencies from scientists, technicians to defence officials who work on missiles and develop interest in entrenching missiles deeper into defence policy potentially resisting efforts for arms control. This is particularly the case with states that have developed an indigenous production infrastructure.

3.4. The rise of regional cruise missiles

Ballistic missiles have historically been the dominant type of advanced missiles in the Middle East, evidenced by their historical proliferation, use and coveting by regional states. While this interest continues, regional actors are increasingly attracted to acquiring land attack cruise missiles (LACM) due to their increasing utility as precision-strike weapons, their capacity to stress air and missile defences, the opportunity to use them in asymmetric warfare and the availability of suitable aerial launch platforms possessed by many regional states (IISS 2020a). The proliferation of LACMs in the region mirrors the growth of cruise missile possession internationally. In 2001, for instance, only three states (Russia, the United Kingdom and the United States) operated conventionally-armed LACMs, but by 2021, that number had swelled to 23 states (IISS 2020b). Within this timeline, the number of Middle Eastern states that either possessed or had LACMs on order increased from zero to nine, in addition to one non-state actor, the *Houthis*.

Most land attack cruise missiles travel at subsonic speeds on low altitude flight profiles and use terrain masking to increase their survivability against air defences. They present a different problem for a defender when compared to a ballistic missile (Fetter 1991). During the 2003 Iraq war, for instance, US *Patriot* missile defences managed to intercept nine ballistic missiles launched by Iraq but failed to intercept any of its five relatively crude LACMs (Gormley 2003). This makes them a cost-effective way of challenging an adversary with advanced missile defence systems.

Advances in Iran's missile arsenal have also led some US allies in the region to acquire LACMs for counterforce roles. The UAE purchased a variant of SCALP/EG named *Black Shaheen* from France in the 1990s, although it is likely that some modifications were made to the missile to make the transfer arguably compliant with export guidelines of the Missile Technology Control Regime (MTCR) (Lewis 2011). The UAE's acquisition of *Black Shaheen* may have encouraged several other regional states including Egypt, Kuwait, Saudi Arabia and Qatar to also acquire variants of the same system from willing Western suppliers (IISS 2020a). Conversely, the US's refusal to supply *Tomahawk* cruise missile to Israel in 2000 might have spurred its development of an indigenous cruise missile design (Nuclear Threat Initiative 2004). Cognisant of the

capabilities and benefits offered by cruise missiles, Iran began developing its own series of LACMs after acquiring six Soviet-made Kh-55 (RS-AS-15 Kent) systems in 2001. It is likely that Iran had used these Soviet systems to improve their own manufacturing capabilities.

3.5. Thinking of missiles beyond WMDs

Concerns about missile proliferation in the Middle East have been closely tied to fears emanating from their association with Weapons of Mass Destruction (WMD) (Bino 2020). The limited accuracy of early ballistic and cruise missiles helped engrain the view that they were primarily useful with payloads able to inflict widescale damage to compensate for their poor accuracy. WMD concerns remain one factor in appraising the risks posed by the regional proliferation of missiles given their associated history in the Middle East, such as Iraq's use of ballistic missiles with chemical payloads during the Iran-Iraq War, Israel's use of ground- and sea-launched missiles for nuclear weapons delivery and the anxiety surrounding Iran's missile programme that it could ultimately use these to deliver nuclear weapons if it were to develop them. But while the link with WMD is ever present, guidance and accuracy improvements make that framework insufficient to understand the utility of regional missiles, patterns of their recent use, and implications for regional stability.

The use of increasingly accurate missiles armed with conventional warheads has become a common occurrence in regional military operations, with one estimate assessing that more than 90 percent of the roughly 5,000 missiles used in combat has taken place in the Middle East (Gormley 2017). The Syrian civil war provides an example of missile use by internal and external actors as Land attack cruise missiles have been used for example by France, Israel, Russia, the UK and the US, while Russia and Syria have also made limited use of ballistic missiles (BBC News 2018). Iran's use of precision missile attacks against US bases in Iraq in retaliation of the assassination of its military leader Qasim Soleimani is another example of the use of missile with conventional missile loads and that invites analysts to expand the conception of military utility of advanced missiles in the region beyond just a focus on WMDs which has dominated for a long period of time.

The rise of missile defence

Responses to offensive missile programmes in the Middle East have mirrored action-reaction dynamics in other regions whereby states seek to improve their defences to mitigate adversaries' regional offensive capabilities. Interest in missile defences in the Middle East markedly increased following Iraqi ballistic missile attacks that targeted both Saudi Arabia and Israel during the 1991 Gulf War (Bob 2021). In light of the apparent and emerging threat posed by ballistic missile systems, Israel has since developed a sophisticated tiered air and missile defence architecture. *Iron Dome* is tasked with defending against rockets and other small ordnance, while *David's Sling* is able to intercept cruise missiles and SRBMs endo-atmospherically. Israel's *Arrow 3* system operates at the top of this tier system and is capable of intercepting incoming ballistic missiles exo-atmospherically with a kinetic kill vehicle (CSIS 2021).

Among the GCC states, the growth and use of Iranian and proxy non-state actor missiles has accelerated national efforts to expand missile defences. Although efforts to develop integrated missile defences in the Gulf have remained limited, some GCC states have submitted significant equipment requests to the US to improve their defensive capabilities. This includes,

for instance, the potential sale of 44 Terminal High Altitude Area Defense (THAAD) launchers to Saudi Arabia which is expected to be completed by 2027, and the potential sale of *Patriot* PAC-3 systems to the UAE and Bahrain, valued at \$2,728 billion and \$2.478 billion, respectively (Helou 2021; Judson 2019).

Despite efforts by the Saudi-led coalition to thwart *Houthi* missile and AUAV attacks, including a reported 162 intercepts of *Houthi*-launched missiles between March 2015 and April 2020 (Williams and Shaikh 2019), the 2019 Saudi Aramco attacks demonstrated weaknesses in providing protection against threats that are not unidirectional. Efforts to pool GCC resources into common coordinated missile defence have so far not been successful despite US efforts to encourage it and that using a mix of ballistic, cruise and UAV systems can demonstrably challenge air defences (Karako 2016). Cognisant of the GCC states' counterforce capabilities, especially from ALCMs, Iran too has built up a capable missile defence capability, relying on a mix of imported systems such as the Russian S-300 and indigenously developed systems like the recently revealed *Bavar-373* (Iddon 2021).

Historically, the US has been the main provider of advanced missile defence capabilities within the region, although other states are now making this environment more competitive. Russia is increasingly considered by some regional states as a potential alternative supplier, with Moscow having supplied or offered its S-300 and S-400 missile defence systems to several Middle Eastern countries, including US allies such as Turkey, Saudi Arabia and Qatar. Despite apparent inroads by Moscow, Saudi Arabia eventually rejected the possibility of procuring the S-400 due to its planned purchase of THAAD (Helou 2021). Qatar previously expressed an interest in buying the S-400, but as of 2021, no contract had been signed (Kay 2021).

Regional investments in air and missile defences have led to refinements and adjustments in offensive systems to overcome them. For instance, attackers might seek to overwhelm defence systems with volleys of missiles and rockets. Attempts to saturate missile defences was visible during the May 2021 conflict between Israel and *Hamas*, where the latter attempted to overwhelm Israel's *Iron Dome* system with large volleys of rockets (Frantzman 2021). Additionally, missile defence infrastructure have also become a target of AUAV and sabotage attacks. In 2017, it was reported that *Houthis* targeted UAE-operated *Patriot* systems by attacking their main phased arrays (Conflict Research Armaments 2017). More recently, in 2019, the *Houthis* claimed an AUAV attack on a *Patriot* battery stationed at Najran airport in Saudi Arabia (Reuters 2019). All this indicates that missiles and missile defence will exist side by side and the primacy of either defence or offense, will contribute to shaping the future trajectory of missile in the region.

4. Conclusion

This chapter sought to survey the missile landscape in the Middle East. It provided a snapshot into holdings of advanced missiles by various regional states as well as non-state actors. The emerging pictures shows a combination of dynamism and commitment by various states to develop, deploy and sometimes employ missiles. While this dynamism can reveal elements of competitiveness and rivalry between regional states and actors in the missile field, it is more useful to be skeptical about the conclusion that the region is locked in a deterministic action-reaction spirals. Missiles serve diverse functions to various states and are a product of

overlapping acquisition drivers including strategic as well as symbolic. Historically, the chapter outlined three waves of regional missile interest where various actors take the lead in their interest in missiles. Several features characterize the current wave of missile interest. This includes the use of missiles as conventionally armed precision strike weapons highlighting the role these missiles play beyond WMDs. It also includes growing interest in cruise missiles that has increasingly become prominent in missile holdings and the interaction between missile defence and offensive systems.

5. References

- Bahgat, G. (2019). Iran's Ballistic-Missile and Space Program: An Assessment. *Middle East Policy*, 26(1), 31.
- BBC News. (2018, April 12). Syria war: Weapons key players have at their disposal. *BBC*. Retrieved from <https://www.bbc.co.uk/news/world-middle-east-43730068>
- BBC. (2020, January 8). Iran attack: US troops targeted with ballistic missiles. Retrieved from BBC website: <https://www.bbc.co.uk/news/world-middle-east-51028954>
- BBC. (2015, December 14). Yemen conflict: Gulf commanders 'killed in missile strike'. Retrieved from BBC website: <https://www.bbc.co.uk/news/world-middle-east-35091675>
- Bino, T. (2020). A Middle Eastern WMD-Free Zone. *Arms Control Today*, 50(7), 11-16.
- Bob, Y. J. (2021, January 21). Gulf War: How Israel went from 0 to world's best missile defense. Retrieved January 10, 2023, from The Jerusalem Post website: <https://www.jpost.com/middle-east/gulf-war-how-israel-went-from-0-to-best-missile-defense-to-worlds-best-656267>
- Brookes, P., & Phillips, J. (2021). The Growing Danger of Iran's Missile Programs. *Heritage Foundation Backgrounder*, (3605).
- Browning, N. (2016, November 22). Houthi missile arsenal holds a key to future Yemen peace. *Reuters*. Retrieved from <https://www.reuters.com/article/us-yemen-security-missiles-analysis-idUSKBN13H1UU>
- Buzan, B., & Hansen, L. (2009). *The evolution of international security studies*. Cambridge University Press pp 176-182
- Carus, W. S. (1991). *Ballistic Missiles in Modern Conflict* (No. 146). Praeger Pub Text.
- Cohen, A. (2010). *The worst-kept secret: Israel's bargain with the bomb*. Columbia University Press.
- Cohen, A. (1998). *Israel and the Bomb*. Columbia University Press. P.116
- Conflict Research Armaments. (2017). Iranian technology transfers to Yemen. Retrieved January 10, 2023, from Conflictarm.com website: <https://www.conflictarm.com/perspectives/iranian-technology-transfers-to-yemen/>
- Corera, G. (2006). *Shopping for bombs: Nuclear proliferation, global insecurity, and the rise and fall of the AQ Khan network*. Oxford University Press.
- Defence Turkey (2021, February 21) Formal contract for exporting SOM-B1 ALCMs to Azerbaijan signed!. Retrieved January 10, 2023, from Defenceturkey.com website: <https://www.defenceturkey.com/en/content/formal-contract-for-exporting-som-b1-alcms-to-azerbaijan-signed-4403>

- Egeli, S. (2017). Turkey Embarks Upon Ballistic Missiles: Why and How?. *Uluslararası İlişkiler Dergisi*, 14(56), 3-22.
- Eisenstadt, M. (2015). Missiles and the Nuclear Negotiations with Iran. *The Washington Institute for Near East Policy*, 6.
- Eisentein, M. (1982). Third World missiles and nuclear proliferation. *The Washington Quarterly*, 5(3), 112-115.
- Elleman, M. (2015). Iran's Ballistic Missile Program. *Iran Primer*.
- Eslami, M., & Vieira, A. V. G. (2020). Iran's strategic culture: the 'revolutionary' and 'moderation' narratives on the ballistic missile programme. *Third World Quarterly*, 42(2), 312-328.
- Fahim, K. (2015 September 4). Houthi Rebels Kill 45 U.A.E. Soldiers in Yemen Fighting. Retrieved from New York Times website: <https://www.nytimes.com/2015/09/05/world/middleeast/27-soldiers-in-saudi-led-force-reported-killed-in-yemen.html>
- Fetter, S. (1991). Ballistic missiles and weapons of mass destruction: What is the threat? What should be done?. *International Security*, 16(1), 5-42.
- Frantzman, S. J. (2021, June 3). Israel's iron dome won't last forever. Retrieved January 10, 2023, from Foreign Policy website: <https://foreignpolicy.com/2021/06/03/israels-iron-dome-wont-last-forever>
- Gambrell, J. (2017, October 31). Iran says supreme leader limiting ballistic missile range. Retrieved January 10, 2023, from Associated Press website: <https://apnews.com/article/ali-khamenei-ap-top-news-north-korea-international-news-iran-a9b9ff80f4424ce5be3a4a81e04dc8dc>
- Gormley, D. M. (n.d.). The destabilizing role of missiles in the Middle East. Retrieved January 10, 2023, from Middle East Institute website: <https://www.mei.edu/publications/destabilizing-role-missiles-middle-east>
- Gormley, D. M. (2003). Missile Defence Myopia: Lessons from the Iraq War. *Survival*, 45(4), 61-86.
- Green, W., & Roth, T. (2021). China-Iran Relations: A Limited but Enduring Strategic Partnership. *US-China Economic and Security Review Commission*, 2021-06.
- Helou, A. (2021, November 16). Saudi Arabia has no interest in the S-400, says Russian industry official. Retrieved January 10, 2023, from Defense News website: <https://www.defensenews.com/digital-show-dailies/dubai-air-show/2021/11/16/saudi-arabia-has-no-interest-in-the-s-400-says-russian-industry-official/>
- Hinz, Fabian. "Missile multinational: Iran's new approach to missile proliferation." (2021).
- Iddon, P. (2021, July 31). From Tehran to tel Aviv: The Middle East has some powerful air defenses. Retrieved January 10, 2023, from Forbes website: <https://www.forbes.com/sites/pauliddon/2021/07/31/the-middle-east-has-some-powerful-air-defenses/>
- IISS. (2021a). Israel's ballistic-missile programme: an overview. Retrieved January 10, 2023, from IISS website: <https://www.iiss.org/blogs/analysis/2021/08/israel-ballistic-missile-programme>
- IISS. (2021b). Cruise Missiles in the Middle East. 4-24.

- IISS. (2021c). Open-Source Analysis of Iran's Missile and UAV Capabilities and Proliferation. p. 16, <https://www.iiss.org/-/media/files/research-papers/open-source-analysis-of-irans-missile-and-uav-capabilities-and-proliferation.pdf?la=en&hash=2752E923B8AEAC2312EC802F9DE48187E914715A>
- IISS. (2020a). Cruise missiles continue to make their mark in the Middle East. <https://www.iiss.org/blogs/military-balance/2020/12/cruise-missiles-in-the-middle-east>
- IISS. (2020b). The Military Balance Chart: Land Attack Cruise Missiles. retrived from IISS website: <https://www.iiss.org/blogs/military-balance/2020/02/new-features-military-balance-2020>
- IISS. (2010). Iran's Ballistic Missile Capabilities: A Net Assessment.
- IISS. (2007). Nuclear Black Markets: Pakistan, AQ Khan and the Rise of Proliferation Networks: a Net Assessment.
- Isnard, J. (1996, December 11). Quand Marcel Dassault offrait Jericho à Israël. *Le Monde*. Retrieved from https://www.lemonde.fr/archives/article/1996/12/11/quand-marcel-dassault-offrait-jericho-a-israel_3739178_1819218.html
- Israel, I. B., & Paikowsky, D. (2017). The iron wall logic of Israel's space programme. *Survival*, 59(4), 151-166
- CSIS Missile Threat. (2021 March 3). Israeli air and missile defense. Retrieved January 10, 2023, from Missile Threat website: <https://missilethreat.csis.org/system/israeli/>
- Jericho 3. (2017, May 12). Retrieved January 10, 2023, from Missile Threat website: <https://missilethreat.csis.org/missile/jericho-3/>
- Judson, J. (2019, May 6). State Dept. clears \$2.5 billion sale of Patriot missile defense system to Bahrain. Retrieved January 10, 2023, from Defense News website: <https://www.defensenews.com/land/2019/05/03/state-dept-clears-25-billion-sale-of-patriot-missile-defense-system-to-bahrain/>
- Karako, T. (2015). Getting the GCC to Cooperate on Missile Defense. *War on the Rocks*, May, 13.
- Karp, A. (1988). The frantic Third World quest for ballistic missiles. *Bulletin of the Atomic Scientists*, 44(5), 14-20.
- Karp, A. (1995). Ballistic missiles in the Middle East: Realities, omens and arms control options. *Contemporary Security Policy*, 16(1), 111-129.
- Kay, L. (2021, April 28). No progress in S-400 air defense system sale to Qatar. Retrieved January 10, 2023, from Defense World website: <https://www.defenseworld.net/news/29453/No-Progress-in-S-400-Air-Defense-System-Sale-to-Qatar>
- Kenner, D. (2018). Why Israel Fears Iran's Presence in Syria. *The Atlantic*, 22.
- Kerr, P. (2005 May). Ukraine Admits Missile Transfers. Retrieved January 10, 2023, from Arms Control Today website: <https://www.armscontrol.org/act/2005-05/ukraine-admits-missile-transfers>
- Kristensen, H. M., & Korda, M. (2022). Israeli nuclear weapons, 2021. *Bulletin of the Atomic Scientists*, 78(1), 38-50.
- Kristensen, H. M., & Norris, R. S. (2014). Israeli nuclear weapons, 2014. *Bulletin of the Atomic Scientists*, 70(6), 97-115. <https://doi.org/10.1177/0096340214555409>.
- Kubovich, Y. (2019, August 29). Iran accelerating Hezbollah's precision missile program after years of failure, Israel says. Retrieved January 10, 2023, from Haaretz website:

- <https://www.haaretz.com/israel-news/iran-accelerating-hezbollah-s-precision-missile-program-israel-says-1.7767332>
- Lewis, J. (2014). Why Did Saudi Arabia Buy Chinese Missiles?. *Foreign Policy*, 30.
- Lewis, J. (2011). Storm Shadow, Saudi & the MTCR. *Arms Control Wonk*, (May 31, 2011), retrieved from <http://www.armscontrolwonk.com/archive/204051/saudi-arabiastorm-shadow-the-mtcr>.
- Malyasov, D. (2019, August 8). Saudi Arabia to buy new Ukrainian-made «Grom-2» tactical missile systems. Retrieved January 10, 2023, from Defence Blog website: <https://defence-blog.com/saudi-arabia-to-buy-new-ukrainian-made-grom-2-tactical-missile-systems/>
- McNaugher, T. L. (1990). Ballistic missiles and chemical weapons: The legacy of the Iran-Iraq war. *International Security*, 15(2), 5-34.
- Miller, A. J. (1989). Towards Armageddon: The proliferation of unconventional weapons and ballistic missiles in the Middle East. *The Journal of Strategic Studies*, 12(4), 387-404.
- Muhsin, D. (2019). Houthi use of drones delivers potent message in Yemen War. *The International Institute for Strategic Studies*.
- Nolan, J. E. (2010). *Trappings of power: Ballistic missiles in the third world*. Brookings Institution Press.
- Nolan, J. E., & Wheelon, A. D. (1990). Third World ballistic missiles. *Scientific American*, 263(2), 34-41.
- Nuclear Threat Initiative. (2004, June 9). Israel Develops Ground-Launched Cruise Missile. retrieved from Nuclear Threat Initiative website: <https://www.nti.org/gsn/article/israel-develops-ground-launched-cruise-missile/>
- Phillips, J., & Brookes, P. (2021). Iran's Nuclear Humpty Dumpty: The JCPOA Should Not Be Put Back Together Again. *Heritage Foundation Backgrounders*, (3661).
- Pollack, J. (2011). Ballistic trajectory: The evolution of North Korea's ballistic missile market. *The Nonproliferation Review*, 18(2), 411-429.
- Potter, W. C., & Stulberg, A. (1990). The Soviet Union and the spread of ballistic missiles. *Survival*, 32(6), 543-557.
- Reuters. (2021, February 27). Saudi-led coalition says it thwarted Houthi missile attack on Riyadh. Retrived from Reuters website: <https://www.reuters.com/article/saudi-security-yemen-int-idUSKCN2AR0LB>
- Reuters. (2019, May 23). Yemen's Houthis say they attacked Saudi's Najran airport by drone. Retrieved January 10, 2023, from Reuters website: <https://www.reuters.com/article/us-yemen-se-curity-saudi-drone/yemens-houthis-say-they-attacked-saudis-najran-airport-by-drone-idUSKCN1ST1HJ>
- Reuters. (2015, November 18). Israel says 90 pct of Syria's ballistic missiles used up on rebels. Retrieved January 10, 2023, from Reuters website: <https://www.reuters.com/article/mideast-crisis-syria-missiles/israel-says-90-pct-of-syrias-ballistic-missiles-used-up-on-rebels-idUSL8N13D4M220151118>
- Russell, R. L. (2001). A Saudi nuclear option?. *Survival*, 43(2), 73.
- Sabah, D. (2020, October 5). Ukraine to supply engine for Turkey's next-gen cruise missile: local media. Retrieved January 10, 2023, from Daily Sabah website:

- <https://www.dailysabah.com/business/defense/ukraine-to-supply-engine-for-turkeys-next-gen-cruise-missile-local-media>
- Savelsberg, R. (2020, January 15). 'massive improvement' in accuracy of Iran missiles over Scud-B. Retrieved January 10, 2023, from Breaking Defense website: <https://breakingdefense.com/2020/01/massive-improvement-in-accuracy-of-iran-missiles-over-srud-b/>
- Segal, D. (1988). The Iran-Iraq war: a military analysis. *Foreign Affairs*, 66(5), 946-963.
- Senear, M. (2018). Qatar displays Chinese Missile. *Arms Control Today*, 48(2), 37-37.
- Shaikh, S., & Williams, I. (2018). Hezbollah's Missiles and Rockets. *Center for Strategic & International Studies*.
- Sirrs, O. L. (2007). *Nasser and the missile age in the Middle East*. Routledge.
- Sonne, P. (2019). Can Saudi Arabia produce ballistic missiles? Satellite imagery raises suspicions. *Washington Post*, January, 23, 2019.
- Times of Israel. (2021, October 17). IDF official: Israel expects Hezbollah to fire 2,000 rockets a day in wartime. Retrieved January 10, 2023, from Times of Israel website: <https://www.timesofisrael.com/idf-official-israel-expects-hezbollah-to-fire-2000-rockets-a-day-in-wartime/>.
- UNSC. (2021, January 29). Final report of the Panel of Experts on Yemen (S/2021/79). Retrieved January 10, 2023, from United Nations website: https://reliefweb.int/sites/reliefweb.int/files/resources/S_2021_79_E.pdf
- Williams, I., & Shaikh, S. (2020). *The missile war in Yemen*. Center for Strategic and International Studies (CSIS).