

EU Non-PROLIFERATION CONSORTIUM

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The dynamics of missile proliferation in the Middle East and North Africa

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Background paper

EU Seminar to promote confidence building and in support of a process aimed at establishing a zone free of WMD and means of delivery in the Middle East

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Abbreviations

CSBM	Confidence and security building measure
HCOC	Hague Code of Conduct
MAD	Mutual assured destruction
MENA	Middle East and North Africa
MTCR	Missile Technology Control Regime
TEL	Transport erector launcher
UAE	United Arab Emirates
WMD	Weapons of mass destruction

I. Introduction

Since 1973, when ballistic and cruise missiles were used for the first time in the Middle East¹, missile inventories have constantly been growing.² Israel was the first to introduce the capability in the region, followed by Egypt, Syria, Libya, Iraq, Iran, Yemen, Saudi Arabia and the United Arab Emirates. Several countries have also acquired long range heavy guided rockets (ATACMS—MGM-140) or be on the verge of purchasing them. Turkey, Israel, Iran and Syria continue to develop ballistic or cruise missile programs; along with Egypt, they are the sole countries in the region to have national production capabilities. Conversely, Iraq and Libya are the sole countries that have renounced the possession of long range ballistic means of delivery, for different reasons, however. Iraq was compelled to dismantle its programs and infrastructures whereas Libya renounced them on a voluntary basis in 2003, along with its weapons of mass destruction (WMD). Tripoli pledged to destroy its Scud B (and stored them till destruction) and handed its Scud C over to the United States. Altogether, out of the 18 countries in the region (19 if Turkey is included), 9 of them have acquired or developed missiles, at least 6 of them still have an operational arsenal, and, counting Turkey and assuming (according to open sources) that Egypt is conducting some research on Scud valorization, eight to nine of them are developing new weapons or plan to acquire some.

The Middle East is also the sole region in the world where ballistic missiles have been regularly employed in conflicts. In 1973 Egypt launched three Scuds against Israeli targets, but essentially for political purposes. Libya followed the same logic in 1986 when it fired two Scuds on the Italian island of Lampedusa in an attempt to demonstrate its capacity to retaliate following the 15 April 1986 US air raid.

Iraq and Iran were the first to use ballistic weapons systems and heavy rockets in a protracted military conflict, to strike in depth and, ultimately, to target cities. 800 to 900 of the weapons were used during the 1980–88 Iran–Iraq War. In 1988, during the War of the Cities, Iraq launched 189 Scuds and Al Husseins (an indigenous extended range Scud B) with conventional warheads against six major Iranian cities, 135 of them hitting Tehran. Even if casualties were limited (around 2000 people are said to have died as a result of the missile bombardments; this figure has to be compared with a population of roughly 8.5 million in Tehran in 1988), the political and psychological effects of these bombardments were pronounced and helped to convince Iran that its hopes of victory in the conflict were remote.

In 1991, Iraqi use of around 80 ballistic missiles against the coalition forces, military infrastructures in Saudi Arabia, and Israeli cities during the first Gulf War illustrated another typology of use, combining operational uses against military targets, in a logic of harassment and attrition, and a specifically political use against Israel, in order to drag it in the conflict and undermine the coalition. Although the Iraqi Scud campaign had mixed results with negligible direct military impact in terms of casualties and the like, Scud weapons systems demonstrated a great resilience, and, coupled with the prospect of WMD weaponization, a

¹ Algeria, Bahrain, Egypt, Libya, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates and Yemen. Though generally excluded from the terms of discussion of a WMD-free zone in the Middle East, Turkey is included in this paper because of its major role in the area and its emerging strategic military capabilities.

² Strategic missile are here defined as missiles with such a range and payload that they use with conventional payload is meaningless for military or terror strikes and sufficient to carry weapons of mass destruction. The limits set by the Missile Technology Control Regime, that is 300 km of range and 500 kg of payload is then perfectly convenient but the study will equally include heavy guided rocket, despite inferior range and payload, for those weapon systems provide operational capacity close to short range ballistic missiles and progressively complete them in several regional arsenals.

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real capacity to hinder military operations of the coalition. Ballistic missiles were once again used during the Yemeni civil war in 1994 as well as by Iraq in a much more limited fashion during the 2003 conflict.

The considerable political impact of the Iraqi use of Scuds explains the continued demand for ballistic missiles in the region, even after their procurement became more tightly controlled. In the 1990s, the observance of Missile Technology Control Regime (MTCR) guidelines by most industrial countries manufacturing ballistic missiles led to the quasi prohibition of transfers of complete systems with a range of more than 300 km and a payload of more 500 kg. In light of their inability to obtain systems from traditional providers such as Russia or China, some countries, notably Syria, Iran, Yemen, Libya, Egypt, and the United Arab Emirates (UAE), turned to new providers and proliferation networks to acquire weapons and technology, essentially from North Korea. This trend proved particularly troublesome, given the development of numerous WMD programmes throughout the region at that time, and led the international community to define ballistic missiles coupled with WMD as weapons of mass destruction as such.

The United Nations Security Council Resolution 687 officially established a first link between missiles and WMD by endorsing the proposal (although not in an operational paragraph) to create a zone exempt of WMD and their means of delivery in the Middle East.³ Since then, this tendency has been systematically confirmed, as demonstrated by the strict association of the two in Resolution 1540, which affirms ‘its resolve to take appropriate and effective actions against any threat to international peace and security caused by the proliferation of nuclear, chemical and biological weapons and their means of delivery.’⁴ The resolution defines means of delivery as ‘missiles, rockets and other unmanned systems capable of delivering nuclear, chemical, or biological weapons, that are specially designed for such use’. However, bilateral and multilateral initiatives undertaken thus far have been unable to create any legal instrument to curb their diffusion. Some exploratory talks were held between the Americans, Israelis, and Egyptians on the adoption of confidence- and security-building measures (CSBM) at the beginning of the 1990s, and, in 1999, the UN General Assembly resolution 54/54 F called on the General Secretary ‘to question states about the issue of missiles under all their aspects’ in order to adopt measures to limit their diffusion. None of these initiatives engendered any concrete control instruments. In 2006 the United Nations second Panel of government experts on missiles confirmed the general interest of states in greater controls to curb missile proliferation, as long as they were not concerned:

following on from this general acknowledgement that missiles exert effects on international security, it is universally argued that these effects are only negative in the case of another state’s missiles. No state regards its own missiles as unduly threatening, and all look upon their missiles as both necessary and legitimate. No state regards its own missiles as part of the problem: on the contrary, missiles are often claimed to be a response to the problem, rather than a part of it.⁵

³ Resolution 707, forbidding Iraq to manufacture and possess ballistic missiles can also be cited. Both Resolutions do not require Iraq to destroy all of its ballistic missiles but merely those of 150 km range and more. Security Council, S/RES/707, 15 august.

⁴ Security Council, S/RES/1540, 27 January 2005.

⁵ The issue of missiles in all its aspects, report to the Secretary-General, A/61/168, U.N. General Assembly, 20 July 2006.

The third panel report (2008) denotes the absence of agreement on ways and means to limit missile proliferation and the spread of their technology.⁶ Indeed, the reopening of a dynamic of arms control and disarmament relies on regional initiatives.

Although the universalization of international non-proliferation treaties has progressed significantly in the Middle East and North Africa (MENA) over the last decade, some key countries are still deferring their accession on the grounds of unsatisfactory security conditions or the existence of alleged or confirmed proliferation programmes in the region.⁷ In this context, the willingness of most MENA countries to adopt CSBM for ballistic weapons systems remains slim. Only Iraq, Jordan, Libya, Morocco, and Turkey have signed the 2003 Hague Code of Conduct (HCOC) and regional CSBM are inexistent. The absence of nearly all MENA countries from the MTCR (Turkey being the sole regional member in the wider area and Israel abiding by its guidelines without being a member) may help to understand this reluctance, as some states continue to perceive the HCOC more as a discriminatory instrument designed to reinforce their exclusion from ballistic technology rather than a means of increasing confidence and security.

II. Patterns of acquisition

At first glance, missile demand in the Middle East appears to be generally high but the essence of the demand varies widely from country to country and depends on the very nature of respective perceived threats and national security choices. Contrary to the usual assumption, missile proliferation in the area is not solely linked to the supposed existence of an Israeli nuclear arsenal but to a wide array of threat perception as well as to national forces' operational demands in the theatre.

A classic pattern of acquisition: the case of Israel, Egypt and Syria

Confronted since its creation with deeply hostile neighbours and a considerable numerical military imbalance Israel was the first country to introduce ballistic missiles into the Middle East, the short range (500 km) Jericho I being probably operational at the beginning of the 1970s.⁸ Due to very poor accuracy (circle error probable—CEP—of 1 000 meters), Jericho I is assessed to be effective only with non-conventional payloads, notably with nuclear weapons.⁹ According to some sources, Jericho I has been withdrawn from operational service

⁶ The issue of missiles in all its aspects, Report of the Secretary-General, A/63/176, U.N. General Assembly, 28 July 2008.

⁷ That is to say the Chemical Weapon Convention, the Biological Weapon Convention and the Nuclear Non-Proliferation Treaty.

⁸ The US Jupiters (PGM-19) nuclear IRBM deployed between 1959 and 1963 in Turkey are not considered here for their main target was the USSR.

⁹ The Circular Error Probable (CEP) is the radius of a circle within which half of a missile's projectiles are expected to fall. Despite numerous documented allegations, there is still no official acknowledgment of a nuclear arsenal in Israel. Assessments on programs and capabilities can be found in Hersh, C., *the Samson Option*, (Random House, 1991) and Cohen, A., *Israel and the Bomb* (Columbia University Press, 1998). Concerning the deduction of a nuclear capacity through the assessment of the technical specifications of a missile, Arkin, W.M., Norris, R. and Kristensen, H.M et al. noted in 2002: 'In 1974, the CIA cited the Jericho as evidence that Israel had nuclear weapons, stating that the Jericho made little sense as a conventional missile and was "designed to accommodate nuclear warheads.", Arkin, W.M., Norris, R. and Kristensen, H.M et al., 'Israeli Nuclear Forces, 2002', *Bulletin of the Atomic Scientists*, vol. 58, no. 73, 2002.

but is still recorded in most available open assessments.¹⁰ Israel has developed a longer range MRBM dubbed Jericho II whose range probably covers all neighbouring countries and Iraq. An IRBM (Jericho III) with sufficient range to hit targets in Iran could be in developmental stage but its operational status is unknown. US Lance SRBMs were also acquired in the 1970s. Most of the arsenal is reputed to be stored at the Sdot Micha base, near Tel Aviv.

Regardless of the alleged existence of nuclear weapons, the Israeli arsenal appears to be, from a technical perspective, merely designed for deterrence. Indeed, the acquisition of Lance may suggest that tactical use may have been considered, but one can assume that the missile could also have been purchased for strikes against air defence systems and operated with conventional sub-munitions. Nonetheless, it should be stressed that despite its involvement in numerous conflicts of very various intensity, Israel has demonstrated the utmost restraint regarding the use—or the threat to use—of its ballistic systems and has relied on aviation for theatre and regional strikes. There are persistent allegations that Israel activated its (presumed) nuclear arsenal on 8 October 1973 and in December 1990, on the eve of the first Gulf War. However, in light of the low profile policy adopted by Tel Aviv, and possibly the commitment made to the USA, Israel has no declaratory strategy relating to its alleged nuclear forces and its ballistic systems. Generally speaking Israel has mostly relied on its conventional military superiority to exert deterrence and its weapons acquisition policy and public posture has been dedicated to this goal. Contrary to conventional forces, which are broadly used to defend and promote Israeli interests, the alleged nuclear arsenal seems then to be designed to assure last resort deterrence. Rumours of development of Jericho III support this assessment, the existence of this missile being directly linked to the growing perceived Iranian threat.

Egyptian and Syrian approaches have differed somewhat. In a context of growing Israeli conventional superiority and suspicion of a nascent Israeli nuclear arsenal, these countries have perceived missiles coupled with WMD as the most effective way to restore some degree of strategic parity with Israel. Egypt launched three Scuds against bridges on the Suez Canal in 1973 to demonstrate such a capability, but to date Egypt and Syria have refrained from using and threatening to use their arsenals.¹¹ Despite numerous clashes with Israeli forces and the procurement of SS-21 SRBM, specifically designed for deep strike capacities on the battlefield, Syria has not resorted to employing its missiles, even when they were not coupled with WMD. This decision illustrates the perceived strategic character of ballistic missiles and their integration in a logic of escalation and deterrence rather than battlefield strategy.

The need to enhance deterrence, to possess weapons systems capable of responding to worst case scenarios and to implement last resort strikes appear to be the main drivers of strategic ballistic missile acquisition for Egypt and Syria. In this particular context, the slow defusing of conflicts and the reduction of risks of escalation limit appeal for ballistic missiles, whereas the permanence of a military threat, essentially resulting from a conventional imbalance, induces the exposed country to strive to enhance deterrence, including via ballistic missiles and weaponized WMD.

¹⁰ The IISS Military Balance 2011 still count them but the US National Air and Space Intelligence Center in its *Ballistic and Cruise Missile Threat 2009* ignore all Israeli ballistic missiles. Such a choice is questionable, since the document records Israeli cruise missiles.

¹¹ Concerning the launch of the three Scuds, Sadat, A. wrote: 'I wanted Israel to learn that such a weapon was indeed in our hands, and that we could use it at a later stage of the war; even though Israel had in fact realized from the moment the war broke out that we meant and did what we said' Sadat, A. *In Search of Identity: An Autobiography* (Harper & Row: New York, 1977) p. 265.

Thus, even though Egypt has been confronted with the supposed existence of an Israeli nuclear arsenal since the end of the 1960s, the improvement of security conditions slowly convinced Egypt to renounce any new acquisition. Launched in a post-conflict context and in an atmosphere of uncontrolled regional proliferation of ballistic systems, the Badr programme (Condor 2) was dismantled at the end of the 1980s, roughly ten years after the 1979 peace treaty. Since then, Cairo has essentially endeavoured to keep certain options open through the modernization of its ageing Scud arsenal but has not sought to expand its capacities. Massive US military assistance and the resulting correction of the conventional imbalance also explain the lack of interest on the part of the Egyptian authorities for ballistic solutions. If allegations of development and possible weaponization of chemical agents should prove founded, one can assume that the Egyptian military have adopted a posture identical to that of the Israelis and perceive their arsenal in terms of last resort deterrence. Moreover, the reduced scale and obsolescence of this presumed arsenal would tend to suggest that Egypt considers this kind of strategic deterrence in a purely existential sense.

Identical security concerns, but a dramatically different security environment explains Damascus' decision to increasingly rely on ballistic missiles and, according to numerous open sources, to have weaponized chemical agents. Syria purchased Soviet Scud and SS-21 at the end of the 1970s and 1980s, and decided to rejuvenate its arsenal from the mid-1980s. As following attempts to obtain Soviet SS-23 were foiled, Syria unsuccessfully turned to China in hope of obtaining M-9 and M-11. The quality of the missiles initially retained by Damascus illustrates its willingness to implement a more operational deterrent. Given its failure to purchase such systems, Damascus acquired extended range North Korean Scud (Scud-C/Hwasong 6) in 1990s and is assumed to have widely incorporated chemical weapons in its arsenal. This choice coincides with the near collapse of Syrian conventional forces and the dramatic degeneration of its regional security environment. Clearly, the Syrian decision to favour its missile arsenal at the expense of its conventional forces is not strictly linked to the postulated existence of Israeli nuclear weapons but much more to the need to deter Israel (and at that time Turkey) from mounting military interventions against Syria and its allies. It equally aimed to prevent low intensity conflicts from developing into more intense operations likely to threaten core Syrian interests. The 1998 Adana crisis between Syria and Turkey led Damascus to comply with Ankara's demands regarding the PKK and probably induced Syria to heighten its strategic programmes and to develop its own systems (Scud D). Syria decision to acquire more modern missiles and its tacit acceptance of allegations concerning the weaponization of chemical (and even biological) agents has been rather effective. Eight years after the Adana crisis, during the 2006 Israeli Hezbollah conflict, Israel carefully avoided involving Syria, confirming that ballistic missiles and alleged weaponized WMD could have contributed to a form of deterrence and may have helped redress the conventional imbalance. Notwithstanding political and military isolation, and despite the crude nature of its strategic arsenal and the obsolescence of its armed forces, Syria is still able to implement aggressive sanctuarization, that is to say, an interventionist policy in its neighbourhood backed up by its arsenal. Considering the current climate, where Syria once again finds itself extremely isolated and in the light of the Libyan experience, the modernization of its arsenal and more effective WMD weaponization represent vital assurances that Damascus is unlikely to discard.

Following a comparable pattern, the search for a missile capacity permitting 'aggressive sanctuarization' is probably the main driver behind the Libyan acquisition of several

hundreds of Scuds during the 1970s and 1980s.¹² Once again, this decision was closely linked to the development of WMD programmes, aimed at deterring the many opponents Libyan interventionism was creating. Neither the nuclear threat nor immediate conventional imbalance justified the buildup of Tripoli's arsenal, although the dwindling Libyan population induced sanctuarization to be based on WMD rather than on large conventional forces.

Acquisition by contagion, the spill over effect of the Iran Iraq war

The second wave of ballistic missile procurement in the Middle East, which took place at the end of the 1980s, has far less to do with the existence of a suspected Israeli nuclear arsenal than it does with the 'war of the cities' during the Iran-Iraq conflict. The bombardment of Tehran by Iraqi Al Husseins has been, rightly or wrongly, perceived by the other countries in the region as the major reason which led Iran to open peace talks. Long range ballistic missiles, able to strike major demographic and economic centres, have consequently been seen as 'cheap' substitutes for strategic aviation, with no regard for the specific conditions that led Iran to sue for peace. The February-March Scud campaign against Teheran took place in a context of growing use of chemical agents on the battlefield, heralding possible chemical bombardments on the Iranian capital. For most of the new purchasers, notably Saudi Arabia, who acquired Chinese CSS-2 in 1988, ballistic missile procurement corresponded to a capacity-building logic, aimed at affording them an embryonic capability, likely to be upgraded and potentially coupled with WMD if need be. Despite commitments on the part of several of these new ballistic powers not to associate their ballistic missiles with WMD, these acquisitions demonstrate the critical need expressed by countries in the region to have national means of deterrence at their disposal in a strained security environment.

Beyond the mere need to counter the Iraqi missile strikes, Iranian ballistic programmes obviously followed the aforementioned logic, at least initially. Close examination of the different programmes underway shows that Iran has been primarily interested in the acquisition of a long range capacity, independent of any military efficiency and up to now, most of the missiles that comprise the Iranian arsenal would have only a limited military impact in a conflict scenario. Nonetheless, the emergence of a national production capacity and the increasing capability of Iranian missiles to target the whole of the Middle East, as well a part of Europe, decisively enhances Iran's deterrence and bolsters its status as a regional power. The existence of a national production capacity implies that Iranian military planners can refine their strategies according to the modernization of the arsenal and the number of missiles operationally available. Meanwhile, in a context of creeping conflictuality with neighbouring countries, long range strike capacity permit the exertion of minimal deterrence against a wide array of potential adversaries that otherwise would be likely to gather in an ad hoc coalition. The direct effects of Iran's strategy are already discernable. On a tactical level, the development of heavy guided rockets (Fateh-110 A) and the attempts to upgrade Scuds (Qiam) give Tehran crude deep strike capacities in the theatre and in its immediate vicinity, threatening potential staging area and logistic nodes. On a more strategic level, accumulation of Shahab-2, Shahab-3 or Sejil-2 MRBM puts most capitals and

¹² According to Lennox, D., Libya may have acquired 240 missiles and 80 launchers. Even if Libya used to be one of the regional countries benefiting from the more substantial transfers of Soviet equipment, the figure needs to be handled with caution. *Jane's Strategic Weapons Systems*, Issue 50, Jan. 2009.

demographic centres of potential neighbouring opponents at risk from the threat of massive strikes.

Contrary to any other pattern of acquisition, the Iranian model allows Tehran to surpass the basic minimal deterrence model, based on the possession of few weapons systematically suspected to be loaded with WMD, and to adopt a more operational use. The increasing number of missiles available and their growing specialization facilitate their use with conventional payloads in the early stages of a conflict while leaving a sufficient stock for escalation strategies. Moreover, suspicions of WMD weaponization increase their effect in a logic of escalation dominance (conventional use can lead to WMD use if the crisis worsens). Quite logically, Iran is the sole Middle Eastern state that has more or less formulated a declaratory strategy concerning ballistic missiles, pledging to strike whichever states that would join a coalition against it. However, this capacity is still nascent, since most of the Iranian arsenal is still composed of inaccurate Scud type weapons whose real operational value is dubious.

Iran's ballistic modernization effort is directly linked to its particular situation in the Middle East. From Tehran's point of view, ballistic programmes help enhance national security and deter external powers from interfering in Iranian affairs. However, negative spillovers are numerous, since it is the perceived threat engendered by Iranian programmes (including suspicions of a military nuclear programme) that justifies the recent (or pending) acquisitions of modern US heavy guided rockets (ATACMS) or European cruise missiles by Gulf states. If one can assume that some of them will rely on U.S. weapon systems and security commitments to ensure their national security, other regional players may wish to develop their own capabilities or strive to acquire ballistic systems independently. Rumours concerning the development of Jericho III, with an expected range of 4 500 km, as well as rumours of Saudi interest in the modernization of its aging CSS-2 are symptomatic of this trend.

Lastly, non-state actors have to be taken into account. Syria and Iran are suspected to facilitate transfers of heavy rockets to Hezbollah who are currently fielding BM-27 and WS-1 type rockets. The 2006 conflict between Hezbollah and Israel witnessed an escalation in the use of long range rockets (220 mm and 302 mm), exposing for the first time major Israeli cities (Haifa) to bombardments.¹³ More recently, Israel accused Syria of transferring Scud or M-600 heavy rockets to Hezbollah, accusations that were strongly denied by Damascus, giving rise, nonetheless, to numerous questions. Close ties between Hezbollah and Syria and shared interests in south Lebanon may lead Damascus to use the militia as a strategic buffer against Israel. But in letting Hezbollah acquire heavy rockets Syria could increase the risks of uncontrolled escalation. According to the International Crisis Group, Hezbollah's leader,

'Hasan Nasrallah . . . has pledged to respond in kind to any Israeli action. In mid-2009, he warned that, unlike in the past, Hizbollah would respond to any Israeli strike against Beirut—including against its own southern suburb stronghold—with equivalent targeting of Tel Aviv. In February 2010, he made the broader claim that any damage inflicted upon Lebanon would be matched with equal damage in Israel—an airport for an airport; a factory for a factory.'¹⁴

Hezbollah's inventory is currently sufficient to implement a crude threat of retaliation in kind against Israel. But even if Hezbollah's allies exert some form of control over these weapons,

¹³ Rubin, U., *The Rocket Campaign against Israel during the 2006 Lebanon War*, Mideast Security and Policy Studies, no. 71, The Begin-Sadat Center For Strategic Studies, Bar-Ilan University, June 2007.

¹⁴ *Drums of War: Israel And The "Axis Of Resistance"*, Middle East Report, no. 97, ICG, 2 Aug., 2010.

limiting this risk of involuntary escalation, this control should not be taken for granted. Should those allies alter their policy and renounce their support for the militia, their ability to recover those weapons is uncertain. Moreover, from an Israeli point of view, Hezbollah's allies could be held accountable for strikes against major demographic centres, notably if massive casualties were resulting. The process of escalation can be triggered by a minor incident. The 2006 conflict, which was sparked by the abduction of an Israeli soldier by local Hezbollah militiamen, is an archetypal example.

III. Quantitative and qualitative assessment

Although the Middle East is the region of the world which boasts the largest number of countries in possession of ballistic missiles, the operational status and military value of these systems vary greatly from one country to another. Their contribution to regional stability and instability differs greatly; most of the deployed systems are more or less devoid of any military use but current modernization trend is likely to lead to the implementation of destabilizing strategies.

Numbers and technical characteristics matter

Assessing the quantity of missiles in national inventories is a complex issue. Numerous countries do not reveal how many weapons they have acquired or produced whereas the number and even the type of weapons obtained through proliferation networks is often arbitrarily stated. Scuds were attributed to Algeria up to mid 2000s whereas Syria and Iran were assumed to detain Chinese M-9 or M-11 in their inventories over a long period of time, because of their attempts to purchase these missiles.¹⁵ It was also believed that Iranian Shahab-4 was more or less a derivative from Soviet SS-4 or SS-5, but this system has never been tested. Conversely, some seemingly implausible information proved to be true.¹⁶ Transfers of Soviet SS-N-6 to North Korea have been hinted at for nearly 20 years before the missile was publicly exposed in 2011. Alleged transfers to Iran could then turn out to be real, some elements being possibly used in the third stage of the Safir launcher.

Table 1. Summary of missiles types by range

Category		Range	Missile
BSRBM	Battlefield Short-Range Ballistic Missile and heavy rockets	<150km	Lance, SS-21, Tondar 69, heavy rockets and Frogs
SRBM	Short-Range Ballistic Missile and long range heavy rockets	150-799km	ATACMS, Zelzal 2, Fatheh 110/M-600, Scud-B, Scud C (Shahab 1 and 2), Scud D, Qiam, ATACMS, Jericho I
MRBM	Medium-Range Ballistic Missile	800-2,399km	Jericho II, Shahab-3, Sejil-2
IRBM	Intermediate-Range Ballistic Missile	2,400-5,499km	Possibly Jericho III and Shahab-4.
ICBM	Intercontinental-Range Ballistic Missile	>5,500km	None to date

¹⁵ See for instance Freickert, A., *Missile Survey: Ballistic and Cruise Missiles of Foreign Countries*, Congressional Research Service, RL 30427, May 2004.

¹⁶ Wright, R., 'Russia Warned on Helping Iran Missile Program', *Los Angeles Times*, Feb. 12, 1997; Goldman, S., et al., *Russian Missile Technology and Nuclear Reactor Transfers to Iran*, Congressional Research Service, Dec. 14, 1998.

Uncertainty about these figures is heightened by loose assessments of national production capacities, notably for Syria and Iran, whose arsenals are constantly being upgraded and whose industrial facilities are poorly documented. Production capacities cited in open sources seldom take into account bottlenecks linked to acquisition of subsystems and raw material not domestically produced and may appear to be overestimated or clearly politically oriented to exacerbate the potential risk they are supposed to represent.

Moreover, reliability of the aforementioned missiles is unknown. Most arsenal assessments take into account old stocks of Scuds purchased in the 1980s' and postulate that locally assembled Scuds are as reliable as original Soviet models. Neither propellant degradation nor maintenance issues are taken into account. Indeed, in most cases, no credible estimate of the real number of missiles available for launch can be made. Lastly, missile basing modes are often neglected despite their crucial importance in the definition of operational strategies. Most of them are launched from transport erector launchers (TELs), Syria, Israel, Iran and Saudi Arabia being the sole known countries who retain hardened fixed launch pads or sheltered systems for a part of their arsenal.¹⁷ Reduced numbers of TEL and launch pads preclude the option of massive coordinated strikes and compel most regional military planners to adopt low intensity strategies that can be compared to Iraqi strategies in the 1980s and 1990s. Few countries in the region seem determined to overcome constraints linked to reduced missile stocks and TEL availability. The Iranian development of Qiam (an upgraded and probably more mobile version of Scud), and heavy guided rockets underlines, however, that this issue is of significant importance for states wishing to assemble operational arsenals. Syria acquisition of M-600 demonstrates identical preoccupations.

Table 2. Current missile inventories and potential acquisitions¹⁸

Country	Missile inventory	Range	Payload
Bahrain	30 ATACMS	Up to 300 km (MGM-140B)	227 kg, Unitary High Explosive Warhead (UHEW)
Dubai	Could acquire about 100 ATAMCS	Up to 300 km (MGM-140B)	227 kg; UHEW
Egypt	Exact inventory unknown		
	Scud B	300 km	985 kg, UHEW or sub-munitions
	Alleged modernized Scud-B	Unknown	Allegation of chemical programme, possibility of chemical payloads
Iran	Exact inventory unknown		Unknown but probably inferior to 985 kg
	Fateh 110	210 km	500 kg Conventional payload
	Around 175 Tondar 69 (CSS-8)	130 km	500 kg
	Around 200-300 Shahab 1 and 2 (Scud B/C)	300 km (Shahab-1) 550-600 km (Shahab-2)	900 kg (Shahab-1) 700 kg (Shahab-2)
	25-100 Shahab 3	1 300 - 1 500 km	700 kg
	Sejjil-2	+/- 2 000 km	750 kg

¹⁷ See *Ballistic and Cruise Missile Threat 2009* for an assessment of the number of TELs in the different inventories.

¹⁸ Short range SS-21 are not included in this assessment.

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Country	Missile inventory	Range	Payload
	(initial operational capability) Qiam ¹⁹ (initial operational capability) Alleged BM-25 (Musudan type SS-N-26 derivative) (estimated 18)	+300 km	500-600 kg
Israel	Exact inventory unknown Around 100 Jericho 1 (possibly in storage) and Jericho 2 Lance (possibly in storage) Jericho 3 (in development ?) LORA (not in inventory)	500 km (Jericho 1) 1300-1500 km (Jericho 2) 130 km +/-4 500 km	500 kg (Jericho I) 1 000 kg (Jericho II) Alleged Nuclear capacity 450 kg Nuclear capable
Libya	Scud B Most of them stored after 2003 pending destruction Few of them may still be operational	300 km	985 kg, UHEW or sub- munitions
Saudi Arabia	40 CSS-2	2 500-2 800 km	2 150 kg Conventional payload
Syria	Exact inventory unknown Scud (B/C/D) Between 200-300 (low evaluation) M-600 heavy rockets (Fateh 110 derivative)	300 km (Scud B) 500 km (Scud C) 700 km (Scud D) 210 km	985 kg—700 kg—500 kg UHEW or sub-munitions Alleged chemical or biological weaponization 500 kg Conventional payloads Chemical payload suspected
Turkey	ATACMS (MGM-140) Possibly in inventory J-600 T Yildirim	165 km 150 km (300 km for an extended range version possibly in development)	560 kg, UHEW and sub- munitions
United Arab Emirates	6 to 20 Hwasong 5 (Scud B) May acquire about 100 ATACMS on HIRAM)	300 km 300 km	985 kg Conventional payloads 227 kg UHEW
Yemen	33 Scud B	300 km	985 kg Conventional payloads

Sources: IISS Military Balance 2011; Nuclear Threat Initiative (Shahab 1 and 2, Shahab 3) and Military Balance 2011 (Tondar). Low assessments have been retained for Shahab; Cordesman, A., *Syrian Weapons of Mass Destruction, an overview*, Working Draft, CSIS, June 2, 2008.

¹⁹ According to some assessments, the Qiam could have a range up to 800 km with a 500 kg warhead. See Doug Richardson, "Iran begins deliveries of Qiam 1 finless ballistic missiles", *Jane's Defense Review*, 6 June 2011.

Comparison between arsenals and the resulting threat assessments are also complicated by the very nature of the missiles as well as by the type of payloads that are likely to be used. Scud type (Scud, Shahab 1 and Shahab 2) and Nodong type (Shahab 3) missiles have limited accuracy, usually spread from 350 metres to 750 metres for Scud types (according to the model and the range) and up to more than one or two kilometres for Nodong types. Iranian Sejil is reputed to be more accurate but current assessments should be considered with caution and be considered through the prism of previous assessments of Syrian Scud D accuracy. Irrespective of any serious technical analysis on Scud capabilities, Scud D accuracy has been deemed to be around 50 metres, due to a separate warhead allegedly terminally guided. However, Israeli analysts have recently admitted that the real figure was nearer to 500 metres than to 50 metres.²⁰

On the whole, the accuracy of most ballistic missiles in regional inventories equates to 0.1% (or more) of their range. Knowing that the MTCR (i.e. nearly all purchasers of missile technology) restricts transfers of guidance sets (and afferent technology) providing accuracy inferior to 3.3 per cent of the range of a missile (i.e. 10 km CEP for a 300 km range missile), most of the countries in the Middle East who intend to enhance missile accuracy have to proceed off their own bat or resort to proliferation networks. Iranian and Syrian programmes seem to prove that valorization of Scud type and Nodong type missiles produces marginal results in terms of accuracy, even when separate warheads are adapted. Moreover, despite U.S. official statements affirming an Iranian national capacity for guidance systems²¹, recent proliferation cases have shown a great dependency of Iranian industry on foreign components. In any case, the unavailability of GPS guidance sets precludes the manufacturing of decameter-scale warheads. In the short term, Israel will remain the sole country in the region able to produce high accuracy missiles.

In parallel, attempts to modernize the propulsion of Scud and Nodong type missiles (conversion of 9D21 type engine and Nodong derivatives for UDMH propellant) seem to have failed to date, limiting available options for enhancing their range or payload. Thus, for most of countries in the region, effective modernization of arsenals would require either the acquisition of new types of missiles or the development national industrial capabilities. As said above, membership or alignment to MTCR of nearly all ballistic manufacturers and the harmonization of their export control legislations preclude direct acquisition of Scud equivalents or longer range weapon systems. The obvious solution would be to purchase shorter range missiles and afferent industrial know-how to renew the current weapon systems, pending their subsequent upgrading through national capacities. Turkey (a member of the MTCR) has followed this logic and is currently building up a national capability with licensed production of Chinese systems (WS-1 heavy rockets and short range B-611 missiles). The emergence of a genuine Iranian industrial capacity in the solid propellant field could nonetheless change this paradigm, and some regional states could be tempted to acquire Iranian technology or missiles. Syria's acquisition of Fateh-110 (M-600) heavy guided rockets is a first indication of this trend. For their part and in accordance with MTCR guidelines, many industrialized countries refuse to license ballistic technology in the Middle East but are selling or marketing sub MTCR systems (cruise missiles and heavy rockets).

²⁰ Schiff, Z., 'Syria boosts accuracy of Scud D missile', *Haaretz*, 4 Dec.2005; Egozi, A., Eichner, I. and Weiss, R., 'The Syrian Threat Has Mounted', *Yediot Aharonot*, 2 Feb. 2007; Ben-David, A., 'Israel Sees Increased Hezbollah Capability', *Aviation Week*, May 18, 2010.

²¹ See Missile Defense Agency, *Fiscal Year (FY) 2010 Budget Estimates Overview*, 09-MDA-4527, April 27, 2009.

China's emergence as an alternative provider in the Middle East could induce the U.S. to alter this policy.

Missile payload

The poor accuracy of most strategic missiles currently deployed in the area as well as limited coordinated launch capacities dramatically curtail the operational options of the bulk of the region's ballistic powers. Coupled with conventional warheads, Scud type missiles are solely adapted to terror attacks against civilian targets or, in a logic of harassment, against large military assets or overcrowded staging areas. Numerous studies have highlighted the negligible appeal of inaccurate ballistic missiles for conventional strikes. The assured neutralization of a single air base would require hundreds of Scuds type weapons. Limited accuracy can only be compensated by numbers, that is to say, by the acquisition of more missiles or, with respect to current acquisition trends, by the deployment of heavy guided rockets.²² The latest versions of Chinese WS-3, Iranian Fateh or US ATACMS are efficient substitutes for old Scud systems and may provide regional countries with deep strike capacities in the theater or even 'strategic' capacities in confined areas. In conventional configuration, Nodong type or CCS-2 type weapon systems, with kilometric CEP, offer even fewer options. Scarcity and the cost of this kind of means of delivery preclude any saturation strike strategy. They may primarily be used for 'political' strikes, aimed at demonstrating the vulnerability of the targeted country. But such a conventional demonstration would only make sense if there is a probability of subsequent WMD use.

Fortunately, WMD weaponization on ballistic means of delivery is a rather complex issue, which supposes overcoming a good deal of technical and operational hurdles. In theory, ballistic missiles' heavy payloads make them perfectly adequate to deliver chemical or biological agents, provided they have a minimal accuracy and the chemical/biological agents are sufficiently protected from heat (re'entry phase), adequately spread and not too damaged by bursting (dispersion phase).²³ However, modelling of chemical ballistic strikes tends to prove that their effects on protected populations are 'limited', requiring rather massive strikes to obtain a significant result. The deficiency of command and control (C2), insufficient camouflage and securized communication, the reduced number of launch pads or TEL all rule out the prospect of a massive strike coming out of the blue. Obviously the effects of these constraints would be even more pronounced if chemical warheads were to be delivered by weapons with kilometric CEP. Long range chemical strikes with Nodong type missiles would probably be largely ineffective, or at least randomly successful.

Chemical arsenals would then probably be used as a last resort deterrent, at the height of a conflict, in order to compel an adversary to cease its operations. In such a case, one can assume that some part of the arsenal would already have been destroyed, reducing its effects. Hence, the dissuasive effects of chemical ballistic arsenals vary, according to the retaliation

²² See, for various assessments of ballistic missiles accuracy with conventional payloads, Orletsky, D., *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks, Technology, Scenarios, and U.S. Air Force Responses*, MR-1028-AF, Rand Corporation, 1999; Shlapak, D. [et al.], *A Question Of Balance: Political Context And Military Aspects Of The China-Taiwan Dispute*, MG 888, Rand Corporation, 2009; and Cordesman, A., and Toukan, A., *Operational Analysis of Air, SAM and TBM Forces*, CSIS, Aug. 20, 2009; *Iran's Ballistic Missile Capabilities*, IISS, London, 2010.

²³ Chow, B., Jones, G., Lachow, I., et al. *Air Force Operations in a Chemical and Biological Environment*, Rand Corporation, 1998; Fetter, S., 'Ballistic Missiles and Weapons of Mass Destruction. What Is the Threat? What Should be Done', *International Security*, vol. 16, 1991-1, pp. 20-21; Cordesman, A., *The Proliferation of Weapons of Mass Destruction in the Middle East*, CSIS, 2004.

capacities of the targeted country. They would be optimal against countries deprived of weaponized WMD, since of all WMD, chemical agents are the least restrictive to employ, increasing the prospect of use should a crisis degenerate. But confronted with the risk of in kind or even nuclear reprisals, chemical arsenals only offer limited deterrence and do not guarantee any kind of mutual assured destruction (MAD). The capability of ballistic chemical power to respond to an escalation process and *a fortiori* to envisage escalation dominance is extremely restricted.

Achieving a MAD capacity requires either the weaponization of nuclear devices, a currently unattainable goal for most of Middle Eastern countries, or the efficient weaponization of biological agents. This perspective, which seemed remote for a long time, has to be taken into account. Weaponization of resistant biological strains such as anthrax bacteria may facilitate the construction of a credible deterrence, a moderate amount of missiles being necessary to lastingly contaminate very large areas. Even if anthrax lethality is far lower than that of nuclear weapons, decontamination issues resulting from a massive strike would be daunting and obviously dissuasive. Weaponization of anthrax (or equivalent agents) is then a logical outcome for non nuclear regional countries in search of an assured destruction capability, the main technical issue to address being the reliable encapsulation of strains on the warhead and not the missile's accuracy. Should this hurdle be overcome, crude ballistic missiles would be sufficient to implement a credible deterrent. The combination of weaponized biological and chemical agents would then offer a certain degree of operational flexibility, since countries fielding these weapon systems could initiate to chemical theater strikes and limit the risk of nuclear retaliation. However, it should be stressed that biological warheads coupled with crude ballistic missiles cannot be considered as equivalent to nuclear missiles. The complex handling of the whole weapons system (payload and missile) induces slow reaction times, the military effects of dispersed strains probably remain uncertain and conditioned by specific environmental conditions, by the device retained for the dispersal of the strains and by the technical characteristics of the missile and its payload (accuracy, size of the spores, quality of the spore powder and so on). Confronted with the risk of nuclear reprisal, one can expect that states in possession of biological weapons will proceed with extreme caution and could be receptive to de-escalation.

Table 3. The introduction of chemical heavy guided rockets: the restoration of a chemical strike option

Weapons system	Chemical agent	Amount of chemical agent per tube of missile
122 mm rockets (BM-21)	GB (sarin), VX	BM-21 (40 tubes) GB : 3 kg (x40) VX : 2,9 kg (x40)
140 mm rockets (BM14/16/17)	GB	BM-14/16/17 (16 tubes) GB : 2.2 kg (x16)
240 mm rockets (BM-27)	GB	BM-27 (16 tubes) GB : 8 kg (x16)
Scud	Thicken VX	555 kg
<i>Potential evolution</i>		
Fateh 110 and M-600, payload equivalent to Frog unguided heavy rockets	VX	216 kg

Source: Meyer, C., *L'arme Chimique*, Elipses-Fondation pour la Recherche Stratégique, 2001.

Beyond technical issues arising from biological weaponization, the existence chemical arsenals coupled with modern rockets could restore the appeal of theater strikes. For a long time, constraints attached to inaccurate, crude and scarce ballistic missiles were such that even when coupled with chemical warheads, their use was severely restricted. However, the low cost and growing precision of modern rockets open up new military options and facilitate the implementation of massive strikes in order to neutralize opponents' forces on the battlefield and to neutralize logistic nodes, following a strategy previously conceptualized by Soviet military planners. For countries subject to very strained security environments and to a clear conventional imbalance, the extensive acquisition of long range rockets adapted to chemical operations and the weaponization of biological agents on long range ballistic missiles are a logical outcome that may allow them to implement an effective operational deterrence, strengthening their forces on the battlefield and limiting risks of reprisal.

IV. Missiles and security in the Middle East

The impact of ballistic missiles on security in the Middle East is therefore heterogeneous. For most of the countries in the region, ballistic missiles were initially perceived as wild cards, apparently allowing an ultimate security guarantee whose essence was not precisely defined and as a mean to apply some pressure on potential aggressors. However, the modernization of most of military capabilities in the area, as well as evolving national security priorities have turned this initial perception into a more concrete approach, quite clearly dividing the requirements of the various holders, according to their security contingencies.

Countries considering their very existence—or the very existence of their political regime – to be under threat from regional competitors continue to rely on ballistic weapons systems coupled—or potentially coupled—with WMD. Syria, Israel or Libya have been typical examples. Iran might also fall into this category. In parallel, great regional powers integrated in established security networks, such as Egypt or Saudi Arabia tend to retain a token capacity but essentially rely on conventional means of deterrence to guarantee their core interests. A net degradation of their security environment may lead them to expand their capacity, which also explains their willingness to retain (or to obtain) a minimal capability. In many cases, countries who adhere to such an approach have obsolete weapon systems and ageing stocks and show little—or at least moderate—eagerness to modernize them. Finally, countries that have purchased Scud in the 1990s and found no military utility for them have tended to switch to different systems, ATACMS or heavy rockets, designed for tactical deep strikes. For them, the strategic value of ballistic missiles has diminished, since there are not able to obtain systems that are sufficiently modern to be used without WMD. Moreover, the emergence of Iran as a great regional power tends to federate them in a *de facto* alliance where highly efficient tactical weapons systems are far more in demand than ageing Scuds.

A new missile race

These conflicting evolutions have a far reaching impact in terms of security. Except for a few countries, the need for WMD weaponized on strategic means of delivery is decreasing, whereas the need for long range capacities and afferent missiles is growing. The main driver underlying this evolution is the increasing perception of Iran's military might. Syria and Israel aside, all new acquisition of ballistic and cruise missiles has come from by Gulf states. Obviously, the acquisition of ATACMS by the UAE or Bahrain is designed to integrate them

in a security network shaped by the USA, whose aim is to protect them from Iran. In parallel, the acquisition of high accuracy cruise missiles and precision guided munitions (cruise missiles, GBU-24 PAVEWAY III, GBU-31B V3 Joint Direct Attack Munitions etc.) give the Gulf states a precision strike capability against high value targets whose use can only be conceived in the framework of coalition conflict. In both cases, these means of delivery are supposed to meet a currently limited Iranian conventional threat, since, today, Iranian forces are unable to engage in a regular protracted conventional conflict or project throughout the Gulf.²⁴ Indeed, the Iranian military threat stems more from Iran's ballistic arsenal and fears of a hidden nuclear programme than from its conventional military capabilities. Consequently, the conventional build up and acquisition of long range weapons by Gulf countries can be perceived as a means to prevent potential aggressive sanctuarization.

The perspective is somewhat different from the opposite side of the Gulf. For Iran, expanding its stock of ballistic missile represents the easiest way to inhibit US interventionism and to deter the formation of any coalition, which is the geographical precondition of any military operation. Even if the painful American experience in Iraq helps explain why Iran has escaped any military intervention, one can assume that the Iranian ballistic arsenal has also played a role in this respect. Consequently despite Security Council prohibitions, Iran is likely to expand its arsenal at all costs since it perceives it as a key element in guaranteeing Iranian sovereignty.

Nonetheless, this success comes at a cost, since this still militarily ineffective arsenal has induced a regional arms race which is proving detrimental to Iranian security. Moreover, Tehran should not expect MTCR constraints to preclude any acquisition of long range means of delivery and that neighbouring countries will not reciprocate. The South Korean experience shows that some arrangement can be found once countries subjected to MTCR limitations meet particular security conditions. One can argue that South Korea is a member of the MTCR and that Gulf states are not, but the MTCR does not preclude sales of MTCR compliant systems. The previous sales of Black Shaheen cruise missiles to the UAE, current negotiations on the sale similar weapons systems to Saudi Arabia, as well as projected sales of AGM-84H and ATACMS to several Gulf states are clear signs of relaxed restrictions on transfers of long range weapons and precision guided munitions. In that sense, even if transfers of complete MTCR Category I weapons systems can be ruled out, Iran risks to be confronted with an increasing number of stand off weapons targeting its military infrastructures.

Iran is also confronted with the development of missile defences both around and within the Gulf region. Beside US Aegis/SM-3 deployments in the Mediterranean and the Gulf, countries neighbouring Iran have already obtained various systems (PAC-3/PAC-3 GEM+ for Bahrain, Kuwait, the UAE, and Saudi Arabia, whereas Saudi Arabia is considering the purchase of Aegis type destroyers and the UAE may acquire THAAD). These systems can intercept older ballistic missiles and require newer ones to be fitted with penetration aids on, limiting their range and payload and increasing acquisition costs. Iran will probably choose to retain its old inoperative missiles in its arsenal to saturate the defences and therefore should be slowly compelled to sustain disparate and expensive forces, which will constantly need upgrading, in a pattern already experienced by the Soviet Union. Constant pressure to modernize forces, to protect newer systems at the expense of older ones, and to sustain the ageing ones in order to keep various operational options open is thus likely to put a heavy

²⁴ *Unclassified report on military power of Iran*, US Department of Defense, April 2010.

strain on scarce resources and to exacerbate tensions between strategic forces and conventional forces. In this perspective, the building up of a strategic ballistic missile force which has indisputably reinforced Iranian security could become counterproductive, since national resources would be insufficient to assemble an arsenal strong enough to facilitate truly aggressive sanctuarization, but whose very existence would require constant investment to protect it from increasing capable neighbouring states.

Stabilization and destabilization effects

Indeed, countries in the Middle East should pay more attention to the European and Soviet experience. Ballistic missiles, even coupled with WMD, can provide security and stability to a certain extent. States can live with insecurity as long as they do not feel their very existence under threat. From this point of view the SS-20 experience is clearly illustrative of what can be done and what should not be done. While previous Soviet modernization was not understood as an attempt to upset the balance of forces in Europe, the SS-20 has been perceived as such by NATO countries, leading to the introduction of Pershing II and long range cruise missiles, which the Soviets, in turn, deemed very destabilizing. Soviets archives shows that it was not so much cruise missiles as Pershing II, conceived, in their view, for decapitation strikes, that was perceived as a vital threat to their security, prompting them to negotiate their removal through the INF process. It is worth noting that the U.S. government shared this perception, the introduction of destabilizing systems to counter SS-20 having been essentially seen as a transitory means aimed at disbanding this whole category of armament.

Modernization of ballistic systems is not always destabilizing as long as such systems are not perceived by others as so destructive that they call into question pre-existing military balances and put their own security at risk. Countries introducing destabilizing weapons generally aim at modernizing their forces to broaden their operational options but seldom to exploit their provisional advantage by waging war. Nonetheless, introduction of such systems induce other states to reciprocate, nullifying the imbalance and sometimes even putting their opponent's security at risk. This kind of arms race, sustained by the introduction of very operational weapons systems, aimed at battlefield supremacy, generates military ruptures which in turn exacerbate instability.

The Middle East could be soon confronted with such a situation. Undoubtedly, ballistic missiles and WMD have had a stabilizing effect for some countries in the region, notably for Israel and Syria, for whom possession of such weapons has probably limited the risks of escalation during conflicts, favouring the implementation of an imperfect but rather effective mutual deterrence. The relative ineffectiveness of weapons systems, which were either too powerful or too unsuitable to contribute to conflict management in the majority of cases, has been a crucial element of this deterrence, compelling both states to adopt last resort postures. Some analysts argue that the same stabilization effect could now apply for Iran, whose arsenal partially shelters Tehran from international pressure and military gesticulations but remains at this stage too weak to be used in an operational context. For countries whose security environment is not so strained, such as Egypt, the UAE, or Saudi Arabia, ballistic forces have progressively been neglected, retaining their last resort function but progressively losing their operational potential. The positive effects of these arsenals in the past should be taken into account and one should not expect any of these countries to relinquish them if their security environment does not fundamentally improve. The example of Egypt shows that

even in a context of pacified relationships with a former archenemy, the permanent spectre of potential conflicts compels states in the region to retain some insurance in the form of strategic means of delivery and, in some cases, WMD.

This kind of stable deterrence remains possible only as long as means of delivery and coupled WMD are so crude that a mere existential deterrence can be credibly exerted. Israel, suspected of possessing nuclear weapons, is, in this particular case, an exception. Despite accurate means of delivery and the potential possession of nuclear weapons, Israel has never used or threaten to use its arsenal. At the same time, Israel has, so far, not felt vitally threatened by neighbouring countries' arsenals, limiting the necessity to implement operational deterrence against them. Finally, for Egypt, Israel, and Syria, stability has been reinforced by the acceptance of shared vulnerability, in a very similar pattern to the shared vulnerability of great nuclear powers. Egyptian restraint should be underlined here, since, from Egypt's point of view, it 'shares' a greater vulnerability than Israel.

However, the current trend of missile modernization and proliferation is on the verge of altering this equilibrium, dragging numerous countries in the region into a destabilizing arms race reminiscent of the previous US - Soviet arms race in Europe. Upgraded weapons systems and rumours of weaponization of WMD will inevitably leads countries in the region to acquire more deep strike means of delivery and may induce some of them to weaponize WMDs in order to counter perceived WMD and means of delivery proliferation, conventional imbalances and to overcome missile defences. The increasing technical capability to effectively weaponize WMD on ballistic missiles or heavy rockets and to use them on the battlefield, previously nearly inexistent in the Middle East, will mechanically lead to destabilization, since the mere deployment of heavy rockets or SRBM near a state border can legitimately be perceived as a threat. Such spill-over has already been witness during the Adana crisis between Turkey and Syria, with each country moving long range means of delivery to the border to convey a strategic message.²⁵ Accumulation of deep strike weapons systems will, however, require moving these systems en masse or explicitly putting them on alert, in order to prevent attrition or attempted pre-emptive decapitation strikes. Very operational means of delivery, such as long range heavy guided rockets, could probably have a more pronounced destabilizing effect than old Scuds, due to their greater accuracy and lethality. Ultimately, the security of countries fielding these weapons is bound to decrease while the prospects of conflict will increase.

As noted above, neither modernization of ballistic missile nor WMD weaponization are always destabilizing as such, as long that they guarantee a minimal deterrence and do not lead to the implementation of a more operational one. But the evolution from minimal to operational deterrence fits nonetheless into the schema of weapons modernization and accumulation, larger numbers, greater accuracy and increased resilience entailing a widening of strike options and afferent strategies. Since modernization is unlikely to be prevented—most systems deployed by counties under high security constraints being obsolete—it should be framed in such a way that its destabilizing effects are limited. A classic arms control approach rather than a pure disarmament approach could then be implemented.

²⁵ Aykan, M.B., 'The Turkish-Syrian Crisis of October 1998: a Turkish View', *Middle East Policy*, vol. 6, 1999; Kirisci, K., 'Turkey and the United States: Ambivalent Allies', *MERIA Journal*, vol. 2, no. 4, Nov. 1998.

V. Conclusions: the case for an interim ad hoc missile regime

In light of the worsening relations between Iran and the Gulf states, the modernization of regional arsenals, their increasing strategic capacities and their possible association with WMD, enabling CSBMs and engaging a disarmament process relating to ballistic arsenals would seem to be a matter of great urgency. Several issues should be taken into consideration.

As underlined above, the acquisition and modernization of ballistic missiles go hand in hand with the perceived security environment. As a result, postulating that better security conditions, conventional disarmament and conflict resolution are conditions for the disarmament and elimination of ballistic missiles and WMD is obvious but does not resolve the security equation. The adoption of a radical opposite view, stating that an arms race will lead the weakest country to collapse is another option that no one should encourage, since its outcome cannot be foreseen and could lead to a catastrophe. The inability of countries perceived as threats to regional security to engage in negotiations in order to defuse the arms race could nonetheless lead to such an outcome, as could the deliberate will of countries feeling threatened, and the great powers that support them, to exhaust their opponents.

The intermediate solution is to acknowledge that some ballistic missile capabilities can contribute to regional security, in an interim period. Given that they are the key element of deterrence and that deterrence is the core security value of major countries in the region, the main challenge is to frame deterrence in such a way as to contribute to the security of concerned countries but not to facilitate the implementation of operational deterrence or aggressive sanctuarization. The institution of such minimal deterrence requires states to accept shared vulnerability and, in exchange, to observe restraint in their acquisition. This restraint should concern offensive systems as much as defensive ones, since it is unrealistic to expect a state to curb its ballistic missile forces if its potential adversaries develop limitless defensive systems. In short, an arms control process, very similar in its essence to the arms control process undertaken by the USA and Soviet Union at the beginning of the 1960s should be instigated.

Engaging in an arms control process implies recognizing that each partner can possess certain categories of armament (i.e. ballistic means of delivery), since no negotiation could be initiated without explicit acknowledgement of ballistic inventories. Nonetheless, the process of recognition and negotiation implies that these weapons systems have to be reduced to enhance security, with the ultimate goal of eliminating them in a perspective of deferred (rather than immediate) abolition. In parallel, programmes under international sanctions—i.e. the Iranian ballistic programme—could not be deemed proliferative indefinitely, notably if Iran provides the expected reassurances about its nuclear ambitions and produces evidence that its means of delivery are only coupled with conventional payloads.

These preconditions are important if one expects to enhance regional security via existing international instruments. In such a context and as a first useful step, countries in the region should be encouraged to join the HCOC and to exchange information and data relating to their ballistic assets, tests, and programmes to enhance confidence through transparency. Beyond HCOC, some countries could also consider the adoption of more confidential regional or bilateral CSBMs in order to defuse tensions or suspicions. CSBMs and exchange of data should not be perceived as a security risk. The declaration and identification of missile assets would reinforce deterrence, since it would make them official thereby inducing a right both to possess them and to modernize them.

Should such initiatives be taken and a negotiation on ballistic missiles be engaged, numerous issues are bound to arise. Some states may agree to declare their missile but may be reluctant to identify their payloads. And even so, the imbalance between nuclear and chemical weapons and the great disparity between ballistic missiles will preclude any kind of symmetric reduction. Generally speaking, in a context of weapons systems modernization, the search for minimal deterrence implies the reduction of the number of arms deployed and the acceptance of asymmetries, in a pattern already observed during SALT II negotiations. But quantifying minimal deterrence with systems using means of delivery and payloads of differing quality and nature would be a daunting challenge.

Indeed, one should consider that curbing missile proliferation and limiting the size of arsenals in order to create optimal conditions for a minimal mutual deterrence is one thing and negotiating WMD dismantlement is quite another. Should negotiations on WMDs be intertwined with negotiations on ballistic missiles, the whole process would likely stall given that WMD issues are far more problematic in essence than missiles issues. Conversely, parallel negotiations could lead states to define their needs in terms of minimal missile capabilities and to outline measures aimed at defusing tension and increasing stability. Older elements of arsenals could be placed in storage and some measures of de-alerting could be implemented for some parts of operational arsenals. Such a set of measures could be adopted independently of any decision on WMD, the aim of the whole process being the elimination of excess weapons and the definition of a minimum threshold of operationally deployed weapons. One again, this approach is very similar to traditional arms control processes implemented for a number of years between the USA, the Soviet Union and Russia.

Lastly, one has to admit that decoupled from WMD, ballistic missiles could not be considered as WMD as such. Confusing WMD with their means of delivery should be not be stated as a norm but as an ad hoc principle, specifically designed to curb WMD proliferation. As soon as a state renounces WMD, accedes to international treaties and abides by its commitments, acquisition of ballistic missiles could not be considered as proliferation per se. The relaxation of restraints applied to missile procurement could be coupled with the implementation of a verification process on acquired missiles to ensure that no attempt of conversion for WMD use is initiated. The association of the relaxation of restraints and the monitoring of new weapons systems may incite some countries to reduce their reliance on means of delivery coupled with WMD in order to modernize some parts of their arsenals. MTCR restrictions on technology and industrial transfers should remain in force, since arsenal modernization should not entail the diffusion of ballistic industrial capacities.

These incremental steps will not result in a dramatic decrease of ballistic missile inventories. Countries with residual arsenals, such as Egypt or Saudi Arabia, would probably be marginally affected, whereas countries possessing conventional heavy guided rockets and ballistic missiles would initially only be required to demonstrate greater transparency. But this process could be more effective for countries suspected of fielding ballistic missiles coupled with WMD who could seize the occasion to discard ageing weapons systems but also to demonstrate that some parts of their arsenals are designed for conventional use. Some initiatives may then be adopted to frame the modernization of missiles coupled with WMDs and to limit the destabilizing accumulation of very operational long range conventional means of delivery. Ultimately these measures may restore a certain degree of confidence in the region and eventually lead to a real disarmament process.